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The European Combination Against the American Danger.

The much talked-of plan to boycott America is still being discussed in Europe, and it must give those of us who think of it at all a rather strange sensation to find America looked upon in Europe as something akin to the "yellow peril" and to find that we are regarded as a menace to other nations because we are ready to supply their people with things they desire of better quality and at lower prices than can be quoted by others. In the final analysis this means of course that we offer to these people a portion at least of the benefits of our use of labor-saving machinery and of the abundance of our mines and fields; the offering being made the more effective by very low transportation costs over land and sea. If we are to assume that labor-saving machinery and engineering inventions and improvements generally are made use of for the sake of their results and not simply for the fun of using them, then it would seem that the people of Europe ought to be glad that they can so easily obtain a share of the benefits of our use of them, and we believe that every purchase in a foreign country of an American article or product is an expression of such gladness. We have an abiding faith also that when the agrarians (land owners) of Germany and others succeed, if they ever do succeed, in building up in their own interest a barrier against these blessings, the results will be such that a reaction will speedily take place and the "American invasion" will then be plainly seen to be a beneficent one. England starved her people and hampered her manufactures for years at the behest of her agrarians until finally compelled to repeal the corn laws; no country which does not itself produce an abundance of food products can long maintain such laws in this enlightened age, and with England's experience on record before it. These are some of the reasons why we have faith to believe that no effective combination of Europan states can be made against the foreign commerce of the United States, if we ourselves pursue an enlightened policy and show a disposition to meet the people of Europe half way.

The Reach of the Specialist.

The electrogravure machine and process illustrated and described in the present issue seems to be a striking instance of the success of a man of one idea, or, rather, the success of a man seeking to accomplish a single definite and difficult result. The absurdity of the reproach which has traditionally attached to the man of one idea is here made more than ever apparent. The man of one idea who was behind the electrogravure invention could not possibly have been a man who knew only one thing, or even a few things, but, rather, like Bacon, might have "taken all knowledge to be his province" to bring it all to assist him in the accomplishment of the one operation. The man of one idea such as this is not and cannot be a narrow man, but, rather, one of widest reach; and in this way the men of single ideas have been the winners of life's prizes in all the fields of human endeavor.

The inventor whom we are here referring to must have known many things before he assumed his task. He must first have been satisfied that the doing of it was worth while, by knowing the cost in time and skill of production by the old methods. He must have known the old processes of steel carving in detail in order to know the direction in which success might lie, whether it would promise to be reached by simply following further in the well-trodden ways or by striking out into as yet untrodden paths.

The process adopted would seem to be as far as possible from the old way, so that after all little of the old knowledge was available, and everything had to be started anew. The cutting of steel by electrochemical action is as far as possible from the scratching and scraping and cutting of the same material by purely mechanical means. No intricate machine for operating cutting tools, of which we now have such a variety, was here in the least available, and yet a machine was called for as ingeniously contrived as is usual for any of the cutting tools; and much more than this was called for. It is not possible to follow in detail the process by which the invention was developed and perfected. In perfectly arranging the combination of various agencies finally employed, doubtless one thing had to wait for another, and often the one had to yield to the other, and many arrangements were abandoned or modified as the thing went along. The operation, as we look upon it now, seems to be simple enough, and yet a man must be a chemist, an electrician and a mechanician merely to understand it all, the director or operator must know much more than the onlooker, and the contriver of it all must have known very much more. The electrical current is employed in controlling some of the mechanical movements of the machine as well as in the chemical part of the process, and compressed air also is impressed in its service, so that a dynamo and an air compressor, besides the steam engine or its equivalent, are its constant servants. The invention, while not comparable with the steam engine in world-embracing importance, would seem to have called for a much wider range of knowledge in the possession of its inventor.

A Russian paper, it seems, calls upon the United States Government to either sacrifice Secretary Gage or "compel him to change his views concerning a tariff war." Now, we suppose this does not seem very ridiculous to a Russian paper, but it is a little difficult in this country to compel a man to change his views regarding a tariff war or anything else. If a man has views in America he generally changes them himself if they are ever changed at all. It is our belief that Secretary Gage's views on international trade are in some respects erroneous or that he does not recognize as he should the actual conditions as they exist to-day, but he is not likely to very materially alter his views.

Echoes From the Oil Country.

MY TRIP TO THE PAN-AMERICAN.

After reading of the efforts put forth by patriotic citizens of Buffalo, getting a glimpse here and there in various journals of the mechanical wonders, and, above all, hearing mysterious hints of the opportunities, so soon to be gone forever, that were being neglected, with vague allusions to the cycle that soared in the air, and terrific and gravity-defying loops and flip-flaps from those who had been there, the situation finally became unbearable. There was only one thing to do. I must go to Buffalo. The great Pan-American would be worth a year's growth, or part of a liberal education, to one who wished to grow or to be educated, and the chance of a lifetime must not be missed. No, indeed!

The railroad company evidently understood the situation and reduced the fare and lengthened the time, thus leaving more of a surplus to apply on such trade secrets as some exhibitors charged to divulge. Armed with a return ticket, the addresses of several parties who provide quarters at moderate rates, and an inside pocket with some loose change securely pinned in to enable me to pay street car fare to the depot in case of need, it was a joy to leave the shop for a few days to fill up on the experience of others and get material to elevate the standard of our work.

To say the trip paid is putting it very mildly, and I still had the change when I returned. To try to describe the big show would be foolish; that must be left for real writers and is not for a mechanic. I can only tell some of the little things that struck me.

My first entrance was at the Elmwood gate, and the banners at the Triumphal Court struck my eye and made me feel just like I did when I was going to the circus for the first time. I wanted to hurry for fear I would not see it all. Getting into the Government Building, among the cannon and lighthouses, I began to think how they made some of them, and to feel small and mean to think how little I did know. Then I wanted to know how long it takes to do some of that nice work. I wouldn't know much about fitting a door like the one to the safe deposit vault down in the Ordnance Building. To get it and the hole round, the tapers true, the sizes right and the polish without deep scratches, showed good workmanship. I wanted to see it shut and would have liked to have seen it covered with water for a while to see how really tight and good the joint was, and wondered if a burglar could blow cold air on the door and contract it enough to make a crack for nitro-glycerine; but I had to be content to admire the things as they were. The shell nearby that had pierced an armor plate with little damage to itself had more hard work than ever comes on a lathe tool when it hits a lump that shouldn't be in the casting, and with less damage than the tool often shows. I shall often wish for a piece of that steel.

But these things are beyond me. I know a few lessons about my own craft, but here are people who work what to me is more magic than that of any magician, and I feel a respect for the other fellow and his knowledge and skill and would like to visit at his work home and see him apply his art.

Of course I had to ride on the areocycle. Why? Just to tell folks I had and to look down. It wouldn't break; it was iron or steel, just like a bridge, and bridges are everywhere, and some swing around, and one down in Buffalo rears right up to let boats pass, and has for years. Nothing strange about it, only a nice easy way of getting up high, and doubtless it would be made bigger and higher if it would pay. I was surprised to hear people express fear and distrust, until I remembered it was more in the line of my own trade.

I afterwards got up into the Electric Tower to try to see how the world looked from there. I felt admiration for the men who had planned everything, and for the nerves of the men who had carried the plans out. I did not yearn to climb around on the outside and put on staff and wires and electric lamps. The elevator was pointed out as wonderful on account of its high lift. This did not impress me, as the lift seemed to me to be largely a question of a high place to hitch to and long cables to do the work. Of course, if it fell it might have farther to fall, and the stopping would be more intense; but they are not designed to fall, and confidence in the ability of my fellow craftsmen to figure to correct conclusions is strong in me.

Going up Machinery Hall one day my ear detected a strange clicking sound; here indeed was something unknown; I must see it. Dodging some people going the other way and following the sound like a calf follows a farmer with a pail, I came to an exhibit where at a desk sat a young man talking to another and absent-mindedly swinging one of those little wooden ratchet arrangements the children like to play with. I can't say what the exhibit was, as I was too much interested in tracing the sound to notice as I came up and too much occupied in laughing at myself as I went away.

One small exhibit that struck me very forcibly was a man showing the wonderful qualities of a pen he was selling. The pens most certainly had remarkable endurance, but what impressed me most in looking them over was: how was it possible to make a fountain pen that would write, a metallic pencil with several extra leads and a box to hold them, a pocket, nickel-plated pen-holder with six indestructible pens; a box to put the lot in, and sell the whole outfit for twenty-five cents and give the manufacturer and seller each sufficient profit to keep in business? I think a trip through the works where they were made and a view of the cost-sheets showing the distribution of the various items would be worth a whole lot in the way of education to me. I know the genius having their distribution in hand said he was merely giving them to those who showed their interest by leaving twenty-five cents to pay him for handing them out, but as there were several engaged in the same work, and as their tales varied somewhat, I judged that was their way of attracting attention.

This feat of attracting attention I found to be a great thing, especially after a few personal investigations on the Midway. I shall scan the advertising pages of the "American Machinist" with renewed interest, although they have always been among the most carefully read parts of the paper. A careful viewing of the crowds would seem to indicate that a poor show with a good "barker" did more business than a good show with a poor one.

But, to return to the pens, etc., it would seem that every move in the production would have to be closely watched, and the most thorough methods employed, and doubtless immense quantities made to enable them to be sold at the prices named. I was not surprised to find the fountain pen was not as good as a Wirt or Waterman. I was surprised to find it was a pen at all and would write.

I know there is something worth seeing near the center of the Electricity Building, for it is always crowded there, and I must see, too. Perhaps they are seeing the inside working of one of the new things that may revolutionize our methods as the telephone has done; surely it will be a great thing to see the earlier stages of some of the great ideas. Oh, now I see—I beg pardon, I hear—"I'm going back to Dixie." Sounds lovely, and is wonderful, and I suppose that is to draw the crowd to show how it is done. As I edge my way through and look through and over and around the crowd I see several people make machine music in various directions to give all a chance to hear, and they keep it up, and nowhere do I see the fellow who is going to tell how it is done, but I guess they know what people want, as they seem to have about one-half of the people in the building there.

Meeting many people, I began to hear of a wonderful law-defying (mechanical law), nerve-testing device somewhere on the outskirts of the grounds, and as I had seen a few little things of that kind I determined to see this big one. The little ones of my acquaintance, while some of them had been great defiers, had been mostly poor workers, in something of an inverse proportion. This one I was assured did work. The name even was attractive; just enough of a foreign flavor to lend an uncertainty to it. "Loop-de-

loop," isn't that a nice name? After making a circuit of 180 degrees I found it and was soon the possessor of two tickets, one of which let me look at the wonder and the other gave me the privilege of trying its beauties. I suppose many of you have seen it and know it is an immense slide. A track going down an angle of about 45 degrees, making a complete circle and going up high enough to check the velocity to a reasonable extent. The car, of course, in its rush turns completely upside down in going around the loop, which looked about 40 feet high. I was soon convinced that the car only obeyed the laws in going around as it did, and the men who built it evidently understood them, too, as the construction was substantial. I enjoyed myself very much listening to the reasons given by those around me for the car not dropping when on the top of the circle, and the warning to those about to ride to hold on tight for fear they might fall out. I wondered why they all leaned forward in going around. Wishing to know how it felt to be swung around in the air upside down I decided to try a trip, after seeing that the bottom of the car was good and strong. I was more afraid of going out through the bottom than anything else. Wishing to get all there was in it, I took the front seat and was soon going slowly up the incline hauled by a chain. At the top gravity took hold and slowly the descent began until here we go down the steep rush to the loop. Truly it was terrific. A rush, a roar, a curious sensation of being doubled up and crushed together and the car is up the incline on the other side and rolling smoothly around, giving us a chance to recover and look happy and get ready to tell others what fun it was, only I don't want such fun for ten hours a day, not even at a raise in my wages. I know why folks lean forward, though. A moving body wants to go in a straight line and your head has more chance to obey than your feet and goes forward as far as the padded bar will let it.

I would like to know how that thing was designed; whether it was figured out or whether it was just built up and the incline extended until high enough to send the car around. I wonder how the fellow that made the first trip around felt about its being all right. I can now imagine how I would feel if I fell off a six-story building. Most people know how queer it feels when an elevator starts down; this is the same feeling drawn out and intensified. I had never realized before that gravity was always in evidence on some part of my body; that, waking or sleeping, some part of my body was supporting my weight, and if for any reason that evidence was removed I became uneasy and alarmed and the feeling of falling was only such a removal. Strange that I had to go to Buffalo to think of some things that I could think of anywhere if I had only thought of thinking them.

One thing that impressed me favorably was that very few things in the machinery line had on their Sunday clothes; most of them seemed to have on their working style and finish, and had no gold or silver plating where paint is usually supplied. If Mr. Smith should buy me a lathe gold plated I would want him to buy a case for it, and keep the case up at his house with the lathe in it, and keep it locked and himself carry the key. I couldn't possibly let my greasy, grimy hands get hold of it.

It was quite a show in itself to see how one was received at the various exhibits. As I walked slowly along I would stop and look over the collection to see if it was anything I understood or could comprehend. If I stood long enough to show more than a passing interest, the attendant (if one was around) would approach and open up. Some, if I began to talk shop, invited me in, showed me everything of interest, gave me circulars, and in some cases catalogs (after being told I was not the buyer, but came nearer under the head of being the abuser), told me where I could find other machinery of the same kind, explained wherein they believed theirs a little in advance of others and also in several cases where their weak points were, and where to look for trouble. Others were content with generalities, and some, when too many questions were asked, plainly told me they didn't know much about the tools, that if I would come back some other time another man might be there who did. One young man informed me that his firm did not care for the trade of small concerns, such as I worked for; that they were displacing all others with all the large concerns and had not time to meet the requirements of the small concerns. This led to an inquiry as to whether certain defects, which he admitted existed, had ever been remedied. I want to find a way to apply that to the corn-sheller business some day.

I enjoyed myself down among the engines and could talk shop with the men in charge without trouble. They were all gentlemen, so far as I met them, and I did not find one who had the only engine on earth, while they all had faith in their own. It was a gas-engine man that pointed out the beauties of a nearby steam engine, while farther along a steam-engine man explained the difficulties under which the gas engines were working, and how well he thought they were doing. Any one shut down seemed to be able to borrow tools as readily as in a shop belonging to one firm.

Some of the information received made me think of a story I once read in a newspaper of a most remarkable discovery said to have been made. The story was headed "Interesting if True." When the motorman said his brake horse-power was about 20 per cent. more than his actual, he was likely thinking of some fellow putting on brakes going downhill and wanted to make me feel safe by showing it was stopable under all conditions.

Of course this was just the froth on the surface. The catalogs of the makers describe the machines better than I can, and I am glad to see they seem to be willing to let them go into the hands of a machinist. I brought one home with me that was extra well illustrated and was showing it to a friend, calling his attention to the clear-cut way the lathes stood out in it and comparing it to some others I had. He remarked that they were nice enough to frame, and must be the "American Machinist" kind that they advertised. I at once looked to see, and sure enough they were. I did not have time to illustrate my views of the great show, but many of them will linger long in my mind that will never appear in any written account.

W. OSBORNE.

Commercial Review.

NEW YORK, Friday Evening, Nov. 1.

THE MACHINERY MARKET.

It is growing monotonous to repeat week after week that the machine-tool market continues to flourish. Yet it is a story which ought not to weary in the telling, and if it does not constitute news, yet —"no news is good news." Prosperous conditions are well distributed. To the reports of known activity in the West may be added similar statements heard to-day concerning a large manufactory in Rhode Island and a general selling office in Boston. Orders are running small and numerous, reports a house on Liberty street, New York. Trade is not all of the minor order, however, for a railroad deal is understood to have been closed up in this market within the last fortnight which will foot up hard on to $200,000.

We have received a letter from the J. W. Cregar Agency, on "The Bourse," Philadelphia, which indicates a booming trade in that district. They now have five traveling men at the office who are practical mechanics, and their live inquiries are more than enough to keep these men hustling all the time. The number of inquiries is increasing so rapidly that they are negotiating for two more traveling men. Within the past two or three weeks they have booked some very large orders against strong competition. At the time of writing they had arranged with the following concerns to transfer their exhibits from the Pan-American Exposition at Buffalo to Machinery Hall, "The Bourse," and place same in their charge: The Diamond Machine Company, Providence, R. I.; the Bradford Machine Tool Company, Cincinnati, Ohio, and Fox Machine Company, Grand Rapids, Mich. They had nine other concerns that had promised to sign contracts with them for their agency and to transfer their exhibits to the Bourse, and they were expecting to close with these within the next two or three

days. The Cregar Agency has now in its charge at the permanent exhibition over $55,000 worth of machinery and tools. A large stock of Pratt & Whitney small tools has just been put in by the agency to meet current demands.

"For better or worser" the export of many good things in the machinery line developed on this side of the Atlantic is being cut short by the establishment of works under one sort of an arrangement or another to manufacture them abroad. The latest instance is the Acme automatic screw machine. Schischkar & Co., of Birmingham, England, have been agents for these machines and have been turning in orders for them which, in the present depressed condition of the British-American machinery trade, have made a conspicuous showing. In fact, the firm has sold over fifty of them in Great Britain in ten months. Following the news of the absorption of the Acme Machine Screw Company in the new National-Acme Manufacturing Company, of Cleveland, reported in our last number, comes information that Schisckhar & Co. have purchased from the Acme Company the British patents on their automatic screw machines and have disposed of them to P. F. Pease & Co., of Darlington, London, Worcester, England. The purchase price was $40,000. It is the intention of Pease & Co. to manufacture all sizes of these machines for the English market, also to lay down a large plant for the output of parts. Pease & Co. have a large factory at Worcester with buildings ready for the reception of machinery for the manufacture of these machines.

The Boston office of the Niles Tool Works Company, Bement, Miles & Co. and the Pond Machine Tool Company has been removed to 144 Pearl street, where Charles H. Kingsbury is the local manager of the above companies.

The Lane & Bodley Company, Cincinnati, Ohio, has lately taken a contract to furnish the firm of Wm. Jessop & Sons, Limited, Sheffield, England, with two Corliss engines of the Twentieth Century type to be installed in the firm's new plant at Washington, Pa.

The new mining machinery company, which, is already announced, is to build a plant at Cudahy, Milwaukee, Wis., has filed articles of incorporation. It is to be known as the Holthoff Machinery Company. The capital stock is $600,000, and the incorporators are William D. Gray, H. C. Holthoff and Benjamin T. Leuzarder.

Orders have been placed with the Watertown Engine Company for steam engines for the electric light plant at the Hudson River State Hospital. This makes the tenth engine and the sixth installation of Watertown work in State asylums and hospitals.

The Northern Engineering Works, of Detroit, Mich., have recently shipped three electric cranes to Glasgow, one to Brussels, and one to Copenhagen. One foreign firm has ordered their third electric Crane of this company's make.

There appears to be no limit to the number of new plants which the Westinghouse Companies are ready to build at home or abroad to carry on their various lines of manufacture. The rumor of something new of this sort is getting to be a matter of almost weekly occurrence, and the fact that these reports have often proved well founded lends weight to any new ones that may arise. The latest is from Little Falls, Minn., and is to the effect that a deal has been closed by which the control of the Little Falls water power has passed to a number of capitalists representing the Westinghouse Electric Company. The new company announces its intention of commencing work at once upon a large plant for the manufacture of machinery used by the Westinghouse Company in its Western trade, and promises that its immediate investment will not be less than $500,000, while it is the intention ultimately to invest fully as much more.

In order to facilitate the moving of coal and to relieve the blockade at the mines, the Pennsylvania Railroad Company has decided to place orders immediately for 13,000 pressed steel cars.

The R. D. Nuttall Company, Pittsburgh, Pa., manufacturer of cut and planed gearing, is installing additions to its machinery equipment, including latest type automatic gear cutters; special machinery for spiral gears; racks, Hindley and ordinary worm gearing; lathes, boring mills, etc. It is adding a 125 horse-power Westinghouse gas engine, making its total horse-power upward of 500. These additions will practically double the capacity of the works. The company has in course of construction a special gear cutter for cutting gears up to 30 feet diameter and 60 inches face. The plant is working day and night, and orders are reported plenty.

During the present week a portion of the shipments of the Wilmarth & Morman Company, of Grand Rapids, Mich., manufacturers of drill grinders, have been as follows: Three to Bombay, three to Calcutta, one to Rangoon, one to Singapore, one to Hong Kong, three to Shanghai, one to Manila, one to Montreal, one to the University of Wisconsin at Madison. Of its latest production, style N wet drill grinder with self-contained motor, in addition to four shipped last week for the United States Government, it still has one to go to the Allis-Chalmers Company and one to the Niles-Bement-Pond Company at Plainfield, N. J.

The New Process Raw Hide Company, Syracuse, N. Y., through its English agents, Geo. Angus & Co., has received during the month of October trial orders for its New Process Noiseless pinions from no less than eleven of the leading electric railway companies in Great Britain. The company reports its trade in the general machinery line as steadily increasing, especially in the case of motor-driven machine tools. Since the company's announcement a couple of months ago that it is in position to furnish accurately cut metal gears also, the number of orders received for work in this line has been very gratifying.

The American Gas Furnace Company has just shipped thirteen special gas blast furnaces for the equipment of the British Westinghouse Company through its London agents, Chas. Churchill & Co.

CHICAGO MACHINERY MARKET.

Western manufacturers of machine-shop fittings have enough business booked to give great strength to the market. As expressed by one maker, no one now has the cheek to ask for a concession. These manufacturers have their output usually engaged for months ahead and the small running trade more than suffices to fill in the interstices. Orders for pulleys, hangers and similar goods that were formerly filled in several days now require weeks —more likely months. The maker is indifferent. He loses trade with the utmost composure. Optimism holds sway and no signs are read which do not portend a continuation of most excellent trade through the first half of the coming year, which is about as far into the future as the prophets care to make committals.

There is not much complaint about delayed shipments of goods. Most makers of tools and supplies are doing fairly well by their customers. Still there are exceptions. In a general way, standard goods are much more likely to be sufficient for demands than special sizes or patterns. Building operations continue quite active, aided by recent open weather and a heavy summer demand for builders' hardware, mechanics' tools, etc., has scarcely abated. The scarcity of saws, hammers, etc., that has existed for some time continues. Stocks of anvils are badly broken. Even wrenches are sometimes hard to get. And speaking of special supplies, there is a greater proportion of that class of goods wanted than usual.

The Cleveland Twist Drill Company has opened a store at 17 South Canal street, Chicago, which is in charge of John G. Ladrick, who has been with the company for thirteen years.

ADVANCES IN PRICES.

We mentioned last week that a meeting of the Leather Belting Manufacturers' Association was to be held November 12 to take action on prices. The manufacturers, however, are not waiting for this meeting to make some changes in their rates, but have already pretty generally announced advances of 5 or 10 per cent. The new figures are scheduled in at least one instance to take effect November 5.

Judging from an announcement of a prominent furnace, Northern pig iron is quotable at an advance of about 50 cents a ton over prices published last week.

Various Tools and Fixtures.

BY A. H. CLEAVES.

JACK BLOCKS.

Fig. 1 shows one of a pair of blocks that I find very useful on many occasions. In conjunction with ⅜ commercial screws they are always in place around a planer or shaper where any jacking up of the work is needed. They are exactly square and exactly parallel. They are just right to use on a surface block *c* for squaring up pieces like *a* and *b*. Rub a little Prussian blue, such as comes in tubes for artists' use on the surface and file or scrape to right angles.

AN ADJUSTABLE GAGE.

Fig. 2 is a convenient tool to have, especially in planer and shaper work. It is a base *d*, with a good bottom surface, and studs *e* of different lengths with fine thread at one end and set-screw *f*. It can be set with a large micrometer or vernier, and is extremely reliable to set a planer tool by for close work in conjunction with or without an indexed feed screw on the shaper head. It is equally handy for setting a plain beam caliper by, for use where a micrometer will not go, as in a neck turning.

CLAMP POSTS.

Fig. 3 is a neighbor-in-law to Fig. 2 but intended for use in clamping work on to the planer or lathe in the place of the never-at-hand blocks and the hunted-for metal blocks.

A SQUARING BLOCK.

Figs. 4 and 5 give an idea of a tool for use on the shaper, lathe, milling machine or surface grinder, for squaring the sides of small jig-work, etc. It can be made as shown, in parts, or solid as preferred. The top *g* or front *i* or bottom *h* can be removed and large pieces clamped to the back piece *j*; and Fig. 4 shows the position of *j* changed for milling work, etc.

But what has come to be a fad with me is shown at *k* and also in another figure. This is the function of the block *k*, which is the essence of this tool. It is something I have written up before and consists in transmitting the path of the shaper ram or milling-machine carriage, etc., to the work through the intermediate piece *k*. That is, the block *k* is rectified by planing or milling the surface at *l* while held in the shaper or milling machine vise. Then the squaring block is fastened to *k* through *h* or *j* by the screw *m*, and whatever accuracy belongs to the shaper ram or milling machine bed is duplicated in the work. It is of course advisable not to move the platen of the milling machine or shaper down after truing up *k* if avoidable. For this line of work this principle when applicable is much preferable to the practice of knocking, and squinting, and shimming up with paper to get work square and parallel.

Figs. 6 and 7 are along the same line and illustrate a case in actual practice. I had an extra angle *Q Q* to plane on the slide *n*. The bottom surface *r* was used. The upper slide was for a frame with emery-wheel spindle for grinding rings. It had a graduated handle on the feed screw, and the extra slide was to run the wheel back to allow of gaging the work; being brought back to the same place against a solid stop-pin. One angle *Q* was again the solid casting; the other against the gib *o* screwed down solid; the slide being tightened at *s*. No loose gib. The usual method for getting *Q Q*, I presume, would be to remove a heavy shaper vise and clamp *n* on to a pair of parallels resting on the platen. But vise and bed are usually out of square to some extent with the vertical slide, owing to dirt in the gibs, etc., and in this case the discrepancy could be found only when the scraping commenced. In particular cases the planer bed is sometimes dressed off, but in this instance I used the strip *p* for both pieces *n* and *o*. For *n* I held it in the vise, as seen in Fig. 6, dressing off *p* with a light cut and clamping *n* to it true by the sides, planing both angles at one holding, setting the head for the right-hand angle last, the same setting being used for the angle on *o*; then turning up *p* endwise (see Fig. 7) and touching off the surface as before for *n*. I held *o* by the two end screw holes for same in ones previously tapped in *p*. Anyone afflicted with scraping made hard by poor planing will excuse the length of this description.

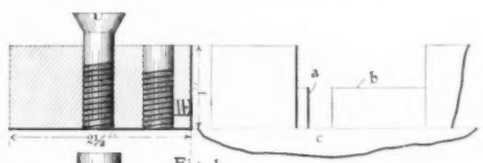


Fig. 1

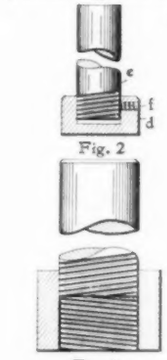


Fig. 2

Fig. 3

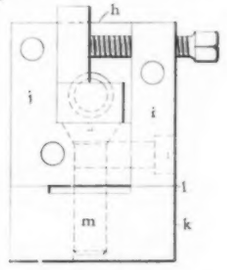
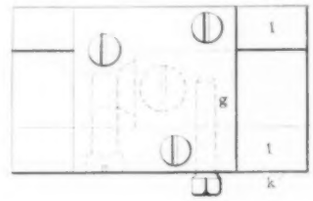


Fig. 4



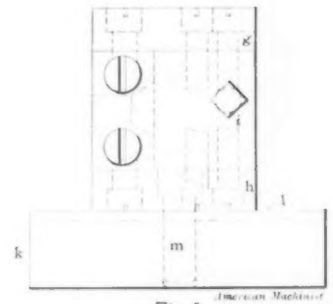


Fig. 5

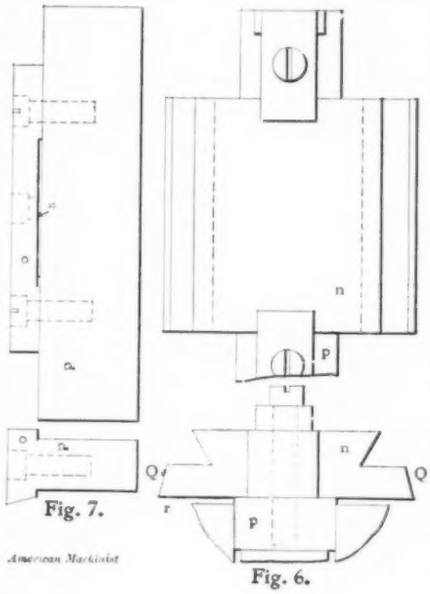


Fig. 6.

Fig. 7.

American Machinist

A ROD-DRILLING JIG.

Fig. 8 ought to find a place wherever the usual amount of this kind of work in machine shops is done. If a prick-punch mark is made on the rod it can be located with the pointer *t* and clamped with the screw *u*, and *v* also on long work. The latter is provided with a small drill hole for small rods. After marking the work through either screw (which act both as jigs and clamps), one of the screws can be removed on straight work and the hole drilled with drill or counterbore of required size, or the work can be moved along and re-located by entering the hole with the starting drill. This is necessary with shouldered work, which must drop down as shown. The piece *w* is for spacing holes when they are drilled over and under or clear though. If drilled clear through, then the same piece *w* can be used for center in the work for reclamping for the larger drill. The holes in the screws *u v* are opened for a shank drill to be used in marking. The piece *w* fits the central slot *x*. By "over and under" I mean that the marked hole comes under when placed on *y*.

Figs. 9 to 13 are not presented as anything new, but rather as old methods of value, not always in use.

SQUARE FOR PLANER.

Fig. 9 is the common fixture used on a planer for squaring work, the item of particular interest to me being the place

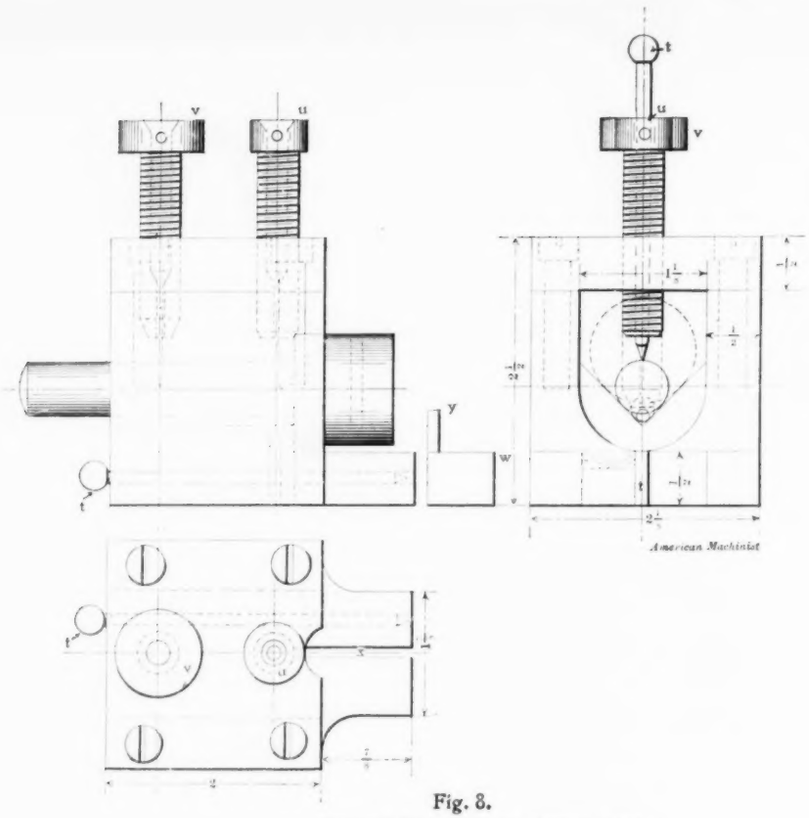


Fig. 8.

FIXTURE FOR DRILLING ROUND RODS.

at *A* for a lifting screw. The tongue can be as tight as desirable in the planer slot and yet be readily removed in this way.

The bolts *B* for clamping work are furnished with oblong heads for removal at any place; and where bolt heads turn in the T-slot and prevent tightening they can be held with a screwdriver in a slot at the nut end *C*.

WEDGE-PINCH. PINCH-BARS.

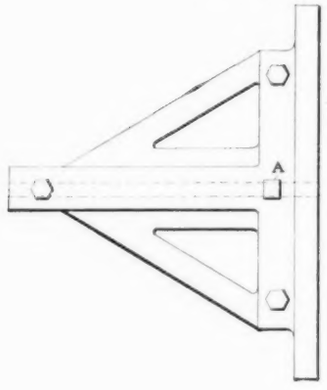
The wedge-pinch *D*, Fig. 12, and what are known as pinch-bars *E E*, Fig. 13, are both reliable devices for hugging work, especially thin work, down to the bed of the shaper, vise, etc. The pinch-bars have two or three degrees angle on the back and a slight one on the front edge. Fig. 10 is the common planer angle-iron for straight work, or in line with the planer movement.

A SQUARING PLUG.

Fig. 14.—To grind the second side of a piece square with the first where no apparatus for the purpose is at hand, turn or grind up a true arbor, square the end, and clamp the same to grinder bed as shown. Then clamp the piece to be squared to the same end with a screw, or otherwise, and grind the top surface.

SQUARE AND OBLONG HOLES.

I found both of the following practices all right. In a heavy steel die stripper,



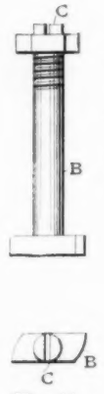


Fig. 11

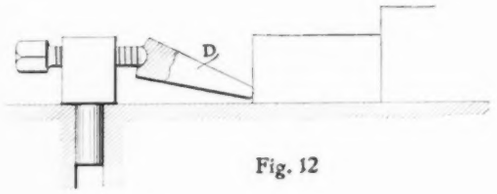


Fig. 12

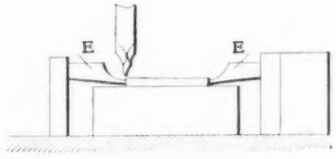


Fig. 13

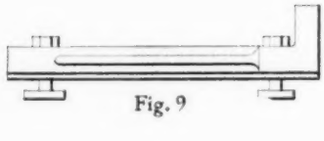


Fig. 9

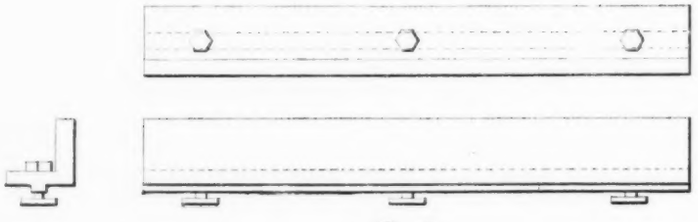


Fig. 10

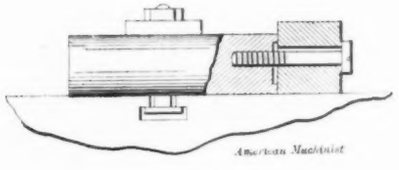


Fig. 14

VARIOUS PLANER AND GRINDER FIXTURES.

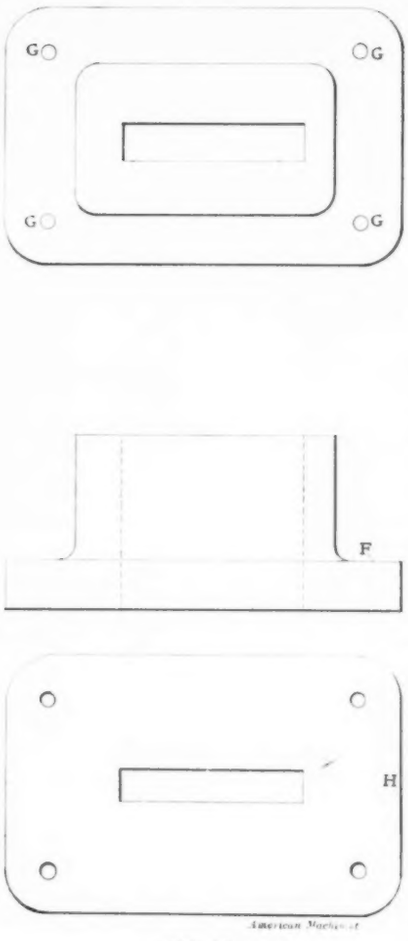


FIG. 15.

Fig. 15, with oblong hole I utilized the four screw-hole places *G*, before milling the stock to *F* for the guide-pin holes for the templets *H*. I used two of these after laying out the work on one and making the other from it for filing out the opening in the block. Other holes used on the die were put in one of the templets and the same was used for filing out the die by. The templets are only 1-32 inch thick, and are hardened between two cast-iron blocks with oil on them. Being the same size as the work, the holes *G* laid out on one templet are transferred to the other and both sides of the block for a little depth, which locates the templet holes opposite on the two sides of the work. It is not much of a trick to keep the file from the hard templets and yet file up to them.

In Figs. 16 to 18 *I* was one of several round pieces with a deep square hole in the center. *K K* were two tool-steel pieces turned concentric, with thin center. The holes fitted the round end of the square arbor *J*, and were filed out square to this arbor. They were then held on the square of the arbor and flattened together at *L*. They were next placed on the ends of *I* by the flattened sides on a surface block and soldered. This brought the square of the hardened disks opposite for filing out *I* by. A friend suggested filing the squares out first and turning the outside off afterwards. That was done anyway, the object being to get the holes out readily and parallel and not to center them.

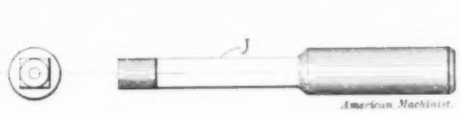


Fig. 16

Fig. 17

Fig. 18

FILING A SQUARE HOLE.

A MILLING MACHINE ANGLE-PLATE.

In this fixture I refer again to the principle of letting the cutter true the work, but under a little different application. It is a well-known practice in milling machine attachments to touch off spots on the jig with the cutter for the work to rest on; and this is the feature I use for general jobbing practice here. In Figs. 19 and 20 let *M* be an overhanging angle-plate on the milling machine bed. If a piece of work *N* is to be milled parallel at any part with its back edge, let the latter rest against studs *O*, held with set-screws, and bottoming too—these to be milled off as mentioned, each time if necessary. Similarly for top parallel work, rest the same on shoulder studs *P P*, milled off like cut.

Fig. 21 shows what I have mentioned in other articles. *Q* is a block held in the vise or screwed to the top of *M*, for small work. The advantages of a small block for small work is in the small surface to be touched off. *R* is the permanent piece for soldering, cementing, or screwing very small work on to, and is perfectly parallel. The thickness of this piece being known, it can be removed and the work measured without unfastening the latter.

In Fig. 22 I have shown the same thing held in a vise crosswise of the bed for milling a small rack, the ends of *S* being left short to touch off quickly.

PARALLELS ON THE DRILL PRESS.

Fig. 23 shows what I saw another man doing. He clamped a pair of parallels to a drill-press table for a shouldered shaft to rest on while he drilled a hole at *T*. It may "help a little."

MILLING A SLOT.

In Fig. 24 the stock *U* has a slot milled in it. The cutter *X* goes through the bushing *V*, sizes a hole in *U* and passes into W. As the milling teeth cut, the chips lift *V*, and the tool sizes a hole in *U* and passes through the guide-piece *Y* to length needed.

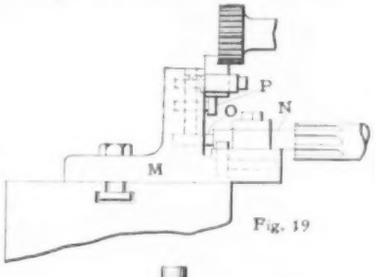
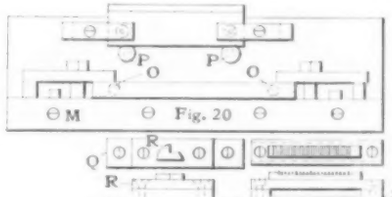


Fig. 19



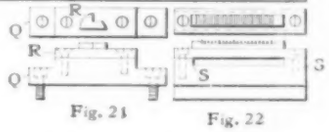


Fig. 21

Fig. 22

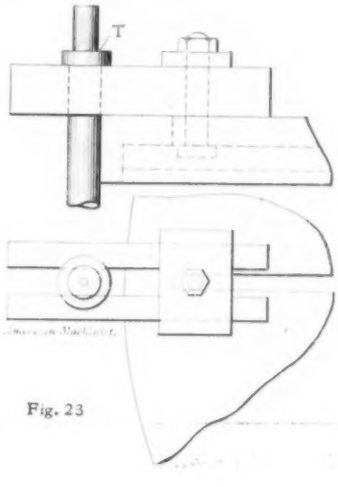


Fig. 23

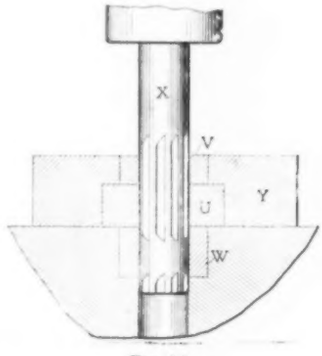


Fig. 24

Some New Machine Tools.

We illustrate herewith a number of interesting machine tools of the recent output of the Newton Machine Tool Works, of Philadelphia, none of which has previously been published.

Fig. 1 shows a cold saw cutting-off machine. The work to be cut off is supported upon the table at the left, or rather upon two separate and independently operated tables in line with each other, the second table being in this view hidden by the saw. The tables are operated by screws lying under and parallel with them. On the hand-wheel shaft is a gear meshing into a gear on each side of it. The nearest

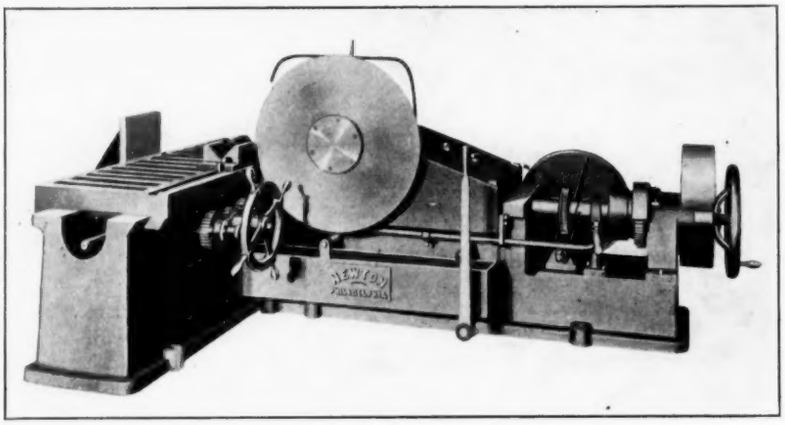


FIG. 1. A COLD SAW FOR CRANK SHAFTS.

gear, plainly seen, operates by means of its shaft and bevel gears the front table, while the other gear operates the other table in the same way. Clutches provide for the disengaging of either screw drive, and then the other screw may be operated by the hand-wheel independently to move its table nearer to or away from the other, and when they are correctly adjusted the clutch is engaged and both screws and their tables move as one. An automatic and variable feed is of course provided for the sawing. This machine is often used for sawing out solid forged cranks, and in this work the cut is apt to close and pinch the saw. In such a case a jack is used between the angle-plate and the shaft to exert a lateral pressure and keep the cut open. The large machine of this type carries a saw 62 inches in diameter and will cut into cranks to the depth of 20 inches. An extra table is provided for the side of the machine for sawing forgings up to 10 inches high and 4 feet wide.

Fig. 2 shows a six-spindle drill for drilling and spacing the holes in six rails at once in the frames of cotton machinery. The platen and bed, shown here broken off at the front, are about double as long as the portion shown. The six spindles are all driven by helical gears on the shaft in the cross-rail of the machine and are fed together, but they can be independently adjusted for different lengths of drills. They are operated by power for the quick return by a pulley at the back side of the machine and separate countershaft. At the top of the machine, in connection with each feed screw, are short horizontal shafts with bevel gears on each. These are merely to lock the screws by means of a spline, the nuts instead of the screws turning for the feed. These nuts are helical gears at their peripheries and are driven by corresponding helical gears on the upper cross shaft. The dividing or spacing mechanism of the table is operated on the same general principle as a gear cutter. A shaft is seen projecting above the point where the gears overlap down at the front of the machine. On the other end of this shaft is a friction that is belted from the

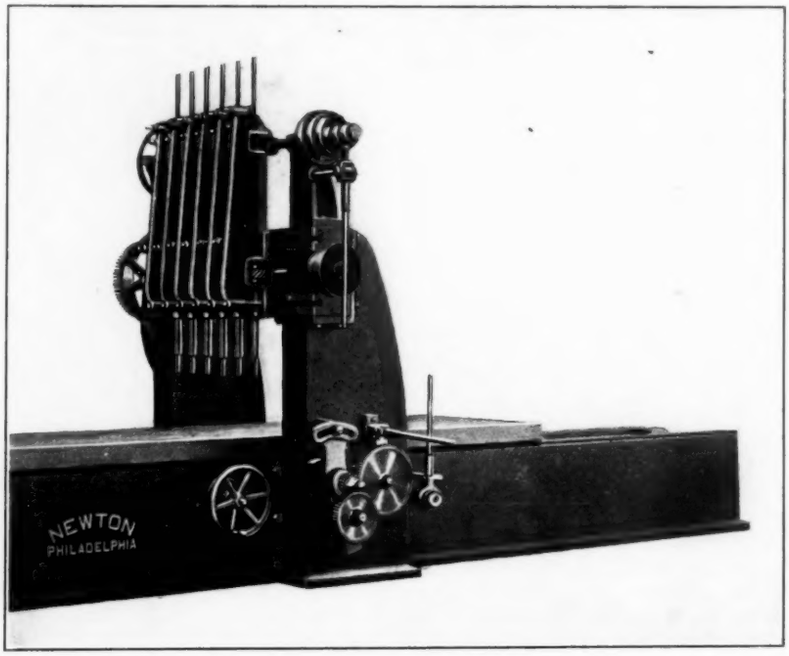


FIG. 2. A SIX-SPINDLE DRILL.

driving shaft that runs constantly. There are change gears for the different spacings required, and when the lever is lifted, releasing the locking pin, one revolution of the large gear is made, moving the table any number of inches desired, according to the change gears used. The table of the machine has a screw rack, or any section of the rack is one-third of a nut section, and a screw 12 inches long works in this rack.

Fig. 3 shows a two-spindle boring machine for boring at once the four bearings of railway motor frames. The heads carrying the spindles, and also the bearings for the other ends of the bars, are adjustable for the required variation between centers; and while both spindles are driven by the one cone, each spindle is clutched on the driving worm wheel, so that it can be stopped or started independently, the feeds for each spindle also being operated

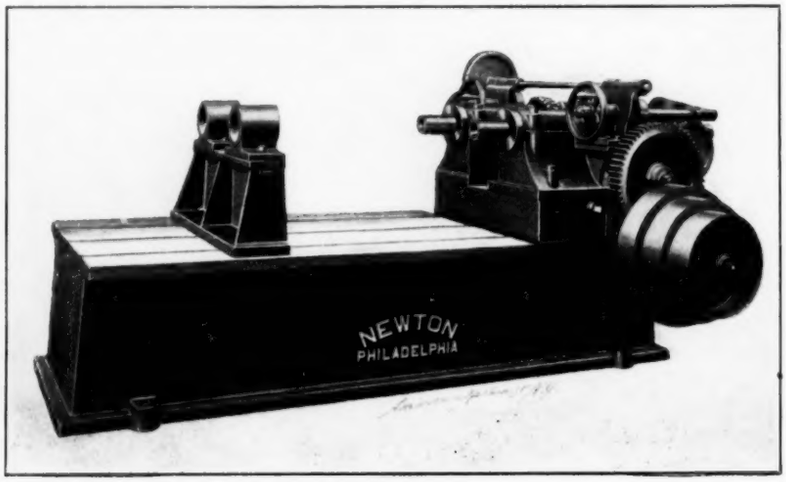


FIG. 3. A TWO-SPINDLE BORING MACHINE.

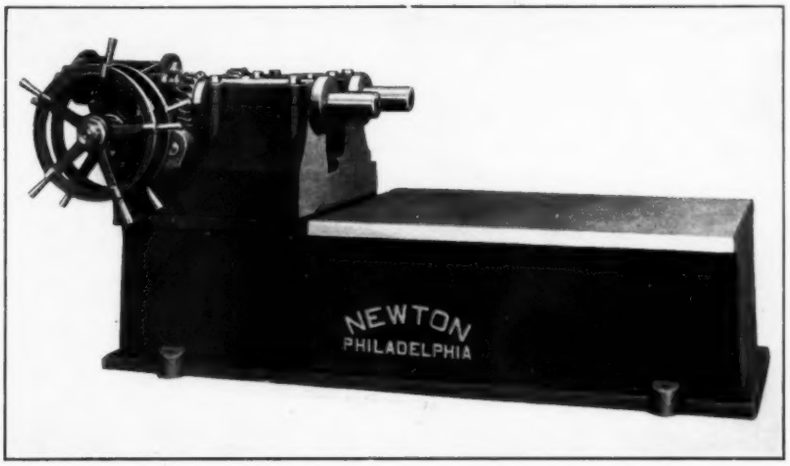


FIG. 4. A TWO-SPINDLE REAMING MACHINE.

separately. The two boring bars used in this machine each carry two sets of cutters, and the four bearings are thus bored at once.

The two-spindle reaming machine, Fig. 4, is not intended for boring, but only for driving the reaming bars without guiding them. The reamers follow holes already bored. The holes are square in the driving ends of the spindles and similar square holes are in the driven ends of the spindles, connections between the spindles and the reamers being used consisting of cylindrical pieces with square projections on each end. The spindles have a fast feed for driving the reamers through the work. The hand-wheels are arranged with a clutch between, so that by pulling one hand-wheel out it operates one spindle quickly and the other wheel operates the other, and when both hand-wheels are clutched together both spindles are operated together. This is for the quick return.

Fig. 5 is a special gear-cutting machine not designed for general work and not automatic, although the makers are now building three machines which are fully automatic. This machine is for cutting steel motor gears up to 3 inches in diameter. The gear to be cut lies in a horizontal position on the dividing table, the dividing being by power. The gearing for the dividing is on the other side of the machine and is operated through a friction with a locking pin, and when the lever at the side on the end of the rocking shaft is lifted the dividing mechanism moves the gear to the next tooth and stops. The automatic feed for the cutter head is arranged, through the gearing on the side, to give two changes, and from a drum on the gear shaft a belt leads to three equal-sized pulleys above. When running, the belt is shifted from one to the other of the three pulleys by means of the vertical rod with a handle on its lower end. One pulley gives a slow movement by sun and planet gears inside it, and the other pulley gives a quick return movement by direct gearing. When the head is up to the required distance the feed is automatically locked until released by a small lever at the back of the lower end of the vertical slide, and as soon as released a spring shifts the belt to the feeding pulley. The hand-wheel is merely for operating the hand feed or adjustment, rotating, through the worm and worm-wheel, the nut on the stationary screw. The spindle of this machine is 4 inches in diameter, and the machine throughout is built for the heaviest duty.

A Multiple Shearing Machine.

We illustrate a machine invented and recently patented by John Lanz, of Pittsburgh, Pa., for cutting bars of metal into short pieces, as required in great numbers in certain lines of manufacture, the operation in this machine being performed not by the successive cutting off of single pieces from the end of the bar, but by cutting a number of pieces simultaneously, the number being greater or less according to the length to which the machine is extended in construction. Fig. 1 is a plan of the machine, Fig. 2 is an elevation of the front, or left-hand end, and Fig. 3 a vertical cross-section on the line 8—8.

The power is transmitted to the machine through the upper shaft, the pinions upon which mesh into spur gears on the larger shaft below. On the latter shaft are eccentrics which work in tumblers or toggles in the horizontally reciprocating heads 2. The stationary knife carrier 8 is attached at each end to one of the standards or uprights 1 of the machine, while the moving knife carrier 9 is attached by its ends to two of the reciprocating heads 2. The spur gears each run loose upon the main shaft, and each engages with a clutch splined to and sliding upon the shaft. The shippers of all the clutches are

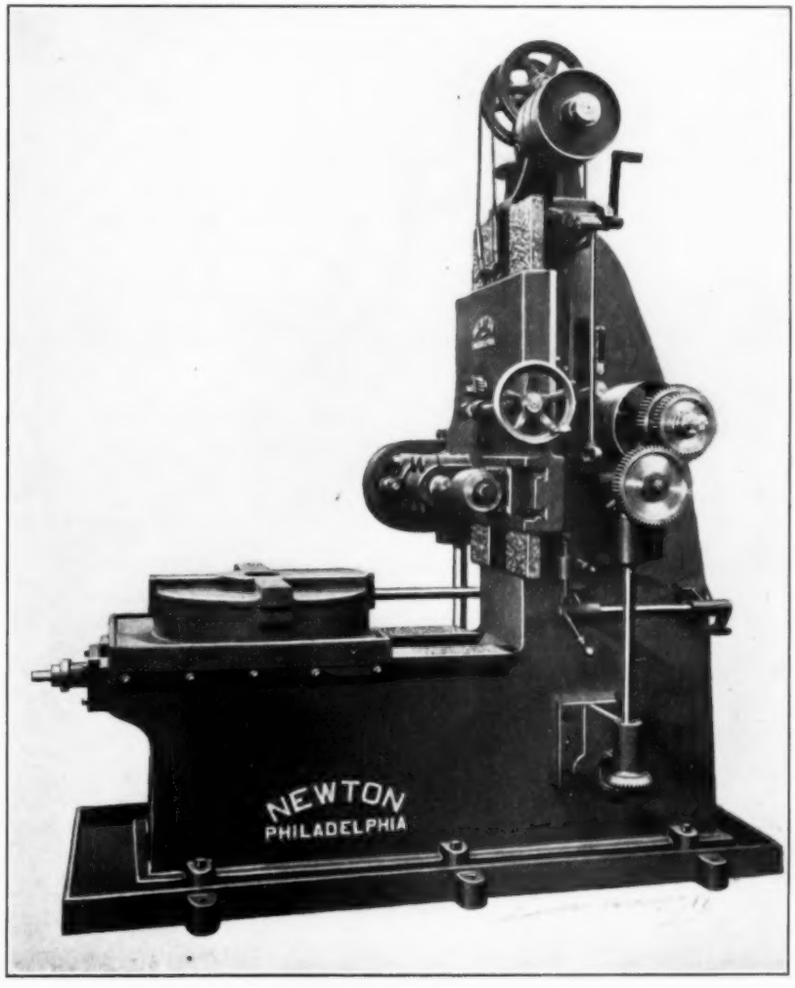


FIG. 5. A GEAR CUTTER FOR HEAVY STEEL GEARS.

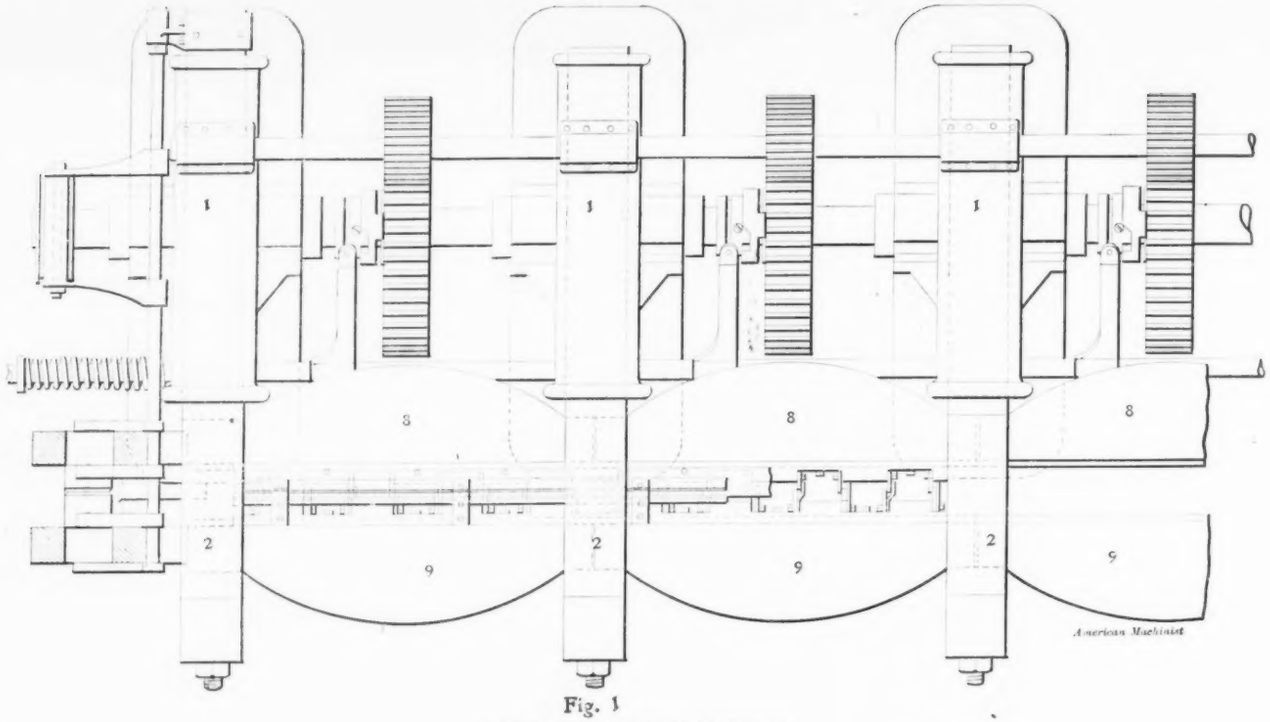


Fig. 1

A MULTIPLE SHEARING MACHINE.

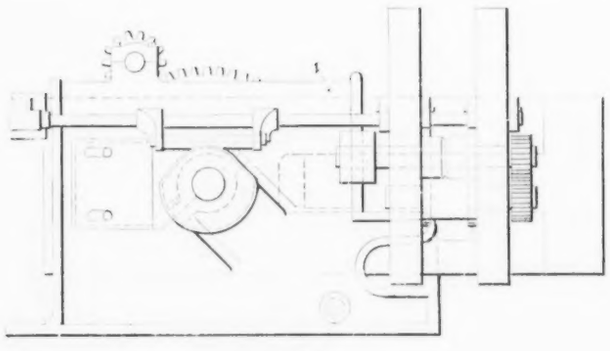


Fig. 2

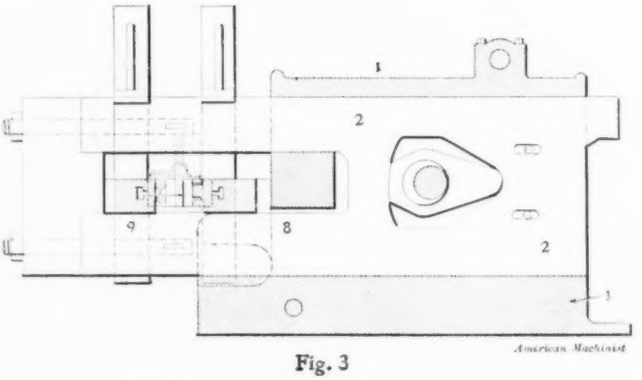


Fig. 3

END ELEVATION AND VERTICAL CROSS-SECTION OF MULTIPLE SHEARING MACHINE.

mounted upon a sliding bar with a helical push spring on the end of it, which normally tends to draw the clutches out of engagement with the clutch jaws on the sides of the gears. Arrangements similar to those employed upon other machines of this character permit the clutches to remain locked to the gears, so that the shaft will run continuously, or to throw them out and stop the shaft at each revolution, just after the shearing operation is completed, this release being principally employed when shearing very long bars.

The shearing operation may be understood by reference to Fig. 4. The bar to be cut—in this case of triangular section—lies between the two angle-irons at the top. These angle-irons are attacned to and move with the knife carrier 9. As the carrier moves to the left, opening the cutting jaws, the bar also is carried to the left, so that it drops off the plate upon which it is shown as resting, down to surface 52 and between the then open cutters, and as the cutter carrier again moves to the right, the pieces are cut off. Each piece is cut with the same end against the fixed cutter and the other end against the moving cutter, so that they are all left as shown; and as the ends of all of them are swung around in the shearing, and therefore do not bind endwise, they easily keep out of the way.

The bars, if not too long, may be slipped sideways into the position shown, ready to drop of themselves into the cutting position, but the machine is designed for cutting longer bars or rods, and is provided with the means for automatically feeding them lengthwise into the machine. All of this feeding mechanism is mounted upon the reciprocating heads 2 and moves with them, instead of being attached to the stationary part of the machine. The rolls at the left, between which the bars are fed, run constantly and are driven by a separate pulley, 61 in Fig. 2, and are connected by gears 62. The bearings of the lower roll are fixed, while those of the upper roll move vertically, and by thus lifting the upper roll at the right time the feeding in of the bar is stopped at the right length, to be resumed again upon the next stroke of the cutter carrier. The lifting of the

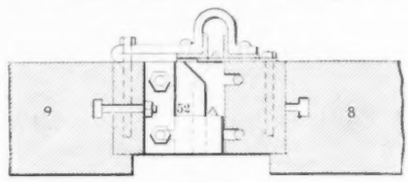


Fig. 4

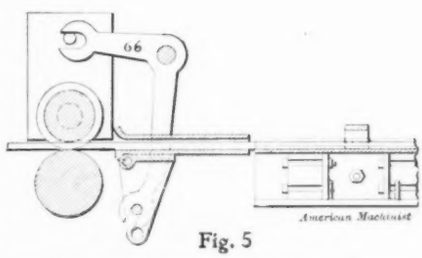


Fig. 5

DETAILS OF MULTIPLE SHEARING MACHINE.

upper roll and the stoppage of the feeding movement are accomplished by a stationary pivoted bell-crank lever 66, Fig. 5, the forked horizontal end of which clasps a pin on the roll bearing. The bar, after leaving the rolls, passes through a leading tube, which is free to move laterally to allow the bar to follow the change of position in the operation of shearing. In feeding into the machine bars of the correct length for it, one pushing the other along, the tilting of the tube is not necessary. The movements are so timed that a bar is fed upon the upper plate while a previous bar is being sheared, and as soon as the entire length of the bar is fed, the bite of the feed-rolls on the bar is released.

An Improved Gisholt Turret Lathe.

The half-tone shows quite clearly an important improvement of the well-known Gisholt turret lathe, or, rather, an improved type of the machine for special lines of work. The principal new feature here shown is in the carriage, which, as will be seen, is supported only on the front V and by a slide down on the front of the bed. The carriage does not extend in over the bed, and the machine is thus enabled to swing work the full size of the chuck and the entire length of the lathe. The type of machine here shown therefore possesses advantages over the regular machine for work of large diameter. The half-tone shows how the carriage may be moved past the chuck and entirely out of the way of the turret. While thus in some cases shorter tools can be used than upon the regular type of Gisholt lathe, it has been demonstrated that if the turret tools are properly supported a few inches more or less in the length of a tool holder practically makes no difference in the quality of the work produced. The carriage is equipped with turret tool-post, and is so constructed that when under heavy cut it is as rigid as with the regular type of slide.

A Fable.

Once upon a Time there was a Man who was a Proprietor of a Machine Works and a Builder of Engines, Machines and Tools. He was likewise a Maker and Perfecter and Fashioner of various Specialties that ingenious Inventors might demand. By reason of long Years of close Study of every Detail of his Business he had become an Expert. He knew how to Estimate Cost and how to Secure a Profit. He built up a vast Trade and was very Successful. But this great Man had a loose Spoke—he conceived that there were not more than Two Dollars in the World and that both of them belonged to him.

He had a happy Faculty of selecting industrious and ambitious Young Men as Assistants, to whom he paid small Wages and whom he educated in all the Ins and Outs of the Business. Budding Genius developed under his careful and vigorous Tutelage, until he soon had a Corps of Assistants who were just as wise as he was. Every Man of the Bunch was a Money Maker for the Chief Push.

No matter how industrious and competent a Young Man might be, he was always regarded by the First Boss as an Apprentice, and was paid but niggardly Wages. As a Consequence the man was constantly losing his most Competent Help to Rivals in the Trade, who were glad to pay a good Price to secure the Services of Skilled Employees. So fast did the Defections from his force grow that soon his Entire Institution became a School of Technology with Graduations, rather than a progressive Business House.

The Man gradually learned that every Graduate who left his House took a certain Clientage with him; he found that his neighbors were in possession of all the Tricks of the Trade that had cost him a Lifetime to Master; he saw his business Undermined and Vanishing.

In this Predicament the Man was forced to Acknowledge that he had learned some new Commercial Lessons. They were these:

"A Competent Commercial Organization is Worth sticking to when Once Perfected.

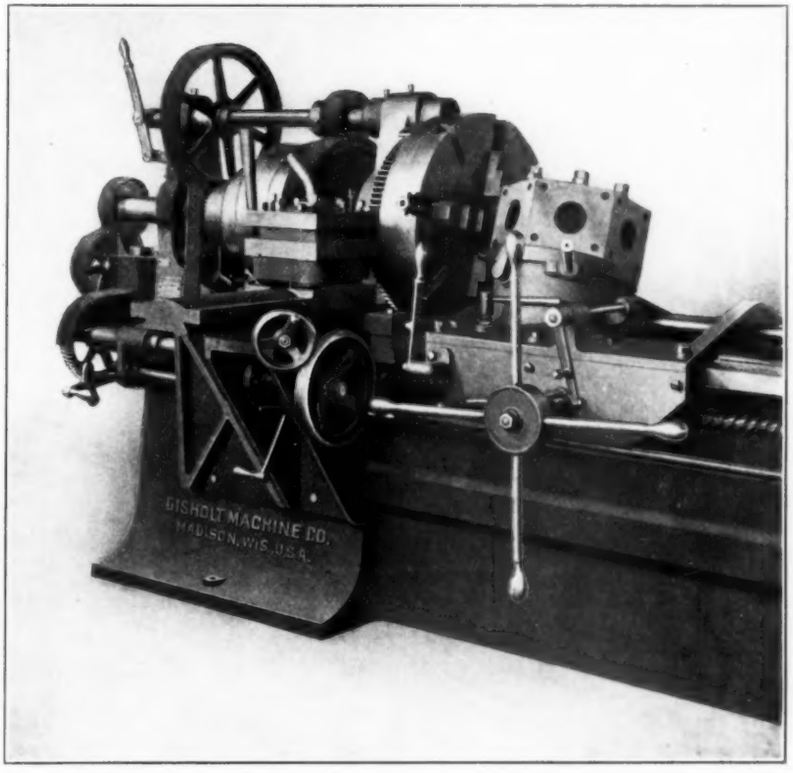
"Reliable and continued Service can be obtained only by Financial Recognition of its Increased Value.

"The Individual trained in the Details that have made a House successful is worth more to that Institution than to any other.

"Profitable Trade Secrets consist largely of the Consensus of the best Judgment of a united and well balanced Force."

Being convinced of the Verity of the Deductions that he had made from his Lessons, the Man carefully and judiciously reorganized his Corps of Assistants, trained them to the Service in a Painstaking Manner and encouraged every Man with Financial Advancement commensurate with his Industry and Worth. The Man's Methods not only Recouped his earlier Success but vastly Multiplied it.

Moral—A Wise Man is one who learns that his Employees must be Prosperous and Satisfied to insure his own Prosperity. —Translated from the "American Lumberman."



IMPROVED GISHOLT TURRET LATHE.

Remarkable Performance of a Small Drill.

Mr. George Schrade, of Walden, N. Y., gives an instance of the remarkable endurance of a small drill. This drill is a No. 52, which is 0.0635 inch diameter. It was used in a Brown & Sharpe automatic screw machine for drilling in a piece holes ¼ inch deep in soft steel. This drill on one occasion ran two days without sharpening, the machine making 2,400 pieces a day, which means that this drill with one sharpening drilled 4,800 holes ¼ inch deep in steel. This is considered a remarkable performance. He states that the cam on the machine is arranged to draw out the drill when the hole is about two-thirds drilled. It is then quickly re-

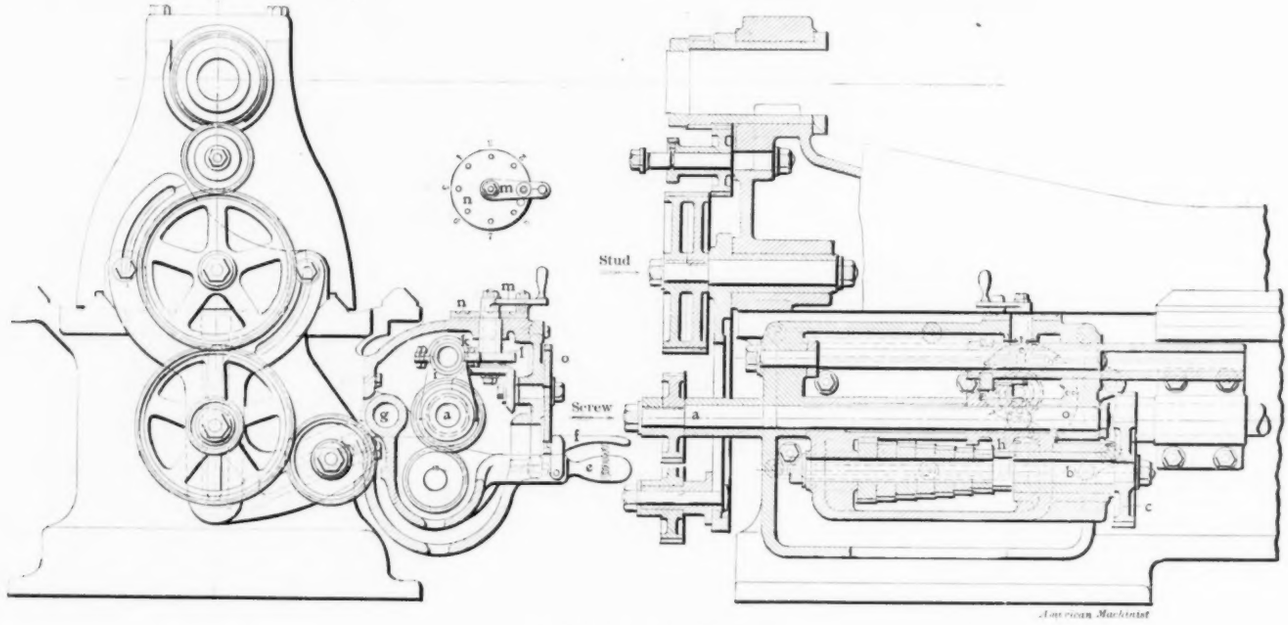
turned and the hole completed. This amounts to 4,800 × 0.25 inch = 1,200 inches, or 100 feet of drilling.

A New Arrangement of Feed Gearing for the Lathe.

A new plan of arranging a nest of feed gears with engaging levers for lathe lead screws has recently been brought out by Schumacher & Boye, of Cincinnati. The accompanying illustration is from a working drawing and shows the arrangement clearly.

Power is delivered from the live spindle to the gear box through the spindle *a* and is delivered to the lead screw through the spindle *b* and gear *c*, the variation of speed being between these spindles. The cone of gears which gives the various speeds is placed on the spindle *b*, which is mounted in a swinging support *d* provided with a handle *e* and latch *f*, and swivelling about the supporting spindle *g*, which is in line with the lead screw. The intermediate idler *h* may be adjusted lengthwise on its supporting spindle and thus be made to face any one of the gears of the cone below it. It is so adjusted by the yoke *i*, rack *k* and spur gear *i*, which is turned by the handle *m*, this handle having a pin which may drop into any one of the holes in the index plate *n* below it. The latch *f* being opened and the cone of gears dropped out of the way, the handle *m* is turned to the hole for the required feed. This motion slides the idler on its supporting shaft to the proper position, and when the handle *e* is again raised the cone of gears are engaged ready for work. Below gear *l* on the same shaft with it is a bevel gear, which, meshing with its mate, turns the index plate *o* with which the pin *f* of handle *e* engages. This plate is therefore turned by the movement of handle *m*. It is scroll shaped, as shown in the side view, and the effect of its being turned in this way is always to bring the proper hole before the pin *f*. To change the feed it is thus only necessary to drop handle *f*, turn handle *m* to the hole required and then raise the handle *f* again, dropping its pin into the only hole of plate *o* which can be reached by the pin.

Eight changes of feed are given in this way, which may be multiplied by changing the gears outside the gear box. A table attached to the headstock shows at a glance the feed given by each setting.



A NEW LATHE FEED GEAR.

Condensing the Steam in the Boiler.

The following clipping is kindly sent us by a correspondent from Vancouver, British Columbia. It shows that the reporter for the daily press there is not behind his Eastern brother in conveying misinformation about things mechanical. Repairing an "accident," as suggested in the last sentence, is worth noticing, but is hardly within our field of criticism:

"Steamer 'Hating,' which was to have departed for Skagway last night, is again at the C. P. R. wharf, having been forced to return on account of an accident to her machinery. She cleared at 2 o'clock this morning, but had proceeded as far as the Narrows, when one of her condensing pumps broke down, and it was necessary for her to come back. The tide was strong at the time, and she went into English Bay, where she anchored for a couple of hours, and returned to the wharf at about 6 o'clock this morning. The condensing pump in the modern steamer is an important part of the machinery, but which does not in any way interfere with her safety. It is used to pump cold water through her boilers to condense the steam to give a greater pressure. The accident will be repaired this afternoon, when the steamer will again set sail."

The Oldest "Atmospheric" Engine.

At Farme Colliery, near Glasgow, there is still running a Newcomen engine, which has been drawing coal since 1809. It is said to be the only engine of its type now in use in Great Britain. The cylinder was never bored. It is open at the top and the piston is packed with hemp. It takes about thirty-five seconds to lift coal from the bottom of the pit. A man works the handle which admits steam to raise the piston and alternately water to condense the steam. No part of the engine has ever been renewed, except one or two spur gears that were broken by accident.

Mr. Gus. C. Henning, of the St. Paul Building, New York, has perfected a form of Extensometer, which is adapted to be applied to bridge members or parts of other structures, such, for instance, as cranes or large machine tools, and which will show by the rotation of a graduated wheel the amount of elongation or compression that takes place in the member to which the instrument is attached. Thus the amount of load or stress to which the part of the structure is subjected is readily deducible by the use of this instrument. Many parts of structures are so situated that the stresses that act upon them are computed only with great difficulty and sometimes without much certainty. The instrument infallibly indicates such stresses accurately, and its great usefulness is therefore readily apparent.

Blanking and Forming a Fancy Shell.

BY JOSEPH V. WOODWORTH.

The half-tone, Fig. 1, will show a fancy round scalloped shell used in large numbers for chandelier work and other ornamental purposes. The metal is thin, soft sheet brass. It was at first decided to produce the shell in one operation by a regular combination blanking and drawing die, but when it was found that this way would

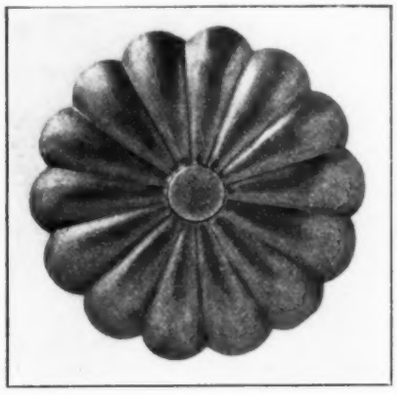


FIG. 1. THE PIECE TO BE PUNCHED.

entail considerable expense and require very accurate work, the dies shown were made instead. To get a perfect blank, the forming and finishing punch and die were made first. These are shown in Fig. 2, and the first part made was the punch. This was of well annealed tool steel, turned at *T* to fit the holder, larger at *S* to shoulder against the face of the holder, and at *R R* to the size to which the shell was to be finished. The punch was then chucked true by the stem *T*, when the face of the punch was finished flat, and a hole was drilled in the center for the stud *J*, which draws and forms the central projection. This stud was made separate and afterwards inserted so that it would not interfere with the finishing of the face. In the milling machine, the scallops on the outside were finished to the proper radius with a special cutter. The face of the punch was roughed out in the same manner, and it was then removed to the vise and finished by hand to templet by the use of files and rifflers, being careful to get sharp edges and symmetrical and correct curves. The outside and face of the punch were then lapped smooth and polished, after which it was hardened and drawn to a light straw temper. In machining the face of the punch, the sharp radiating lines were let in to the proper depth by a sharp angular cutter, which contributed much to the rapid finishing of the curves.

The die *Q* was struck up and finished by using the punch as a hob. It was of flat tool steel, which had first been annealed in an air-tight box in powdered charcoal until as soft as it was possible to get it. It was planed, dovetailed and finished on both sides, and a shallow depression was turned into the center to about 3-16 inch depth and in diameter about ¼ inch less than the outside diameter of the punch at *R R*. It was then heated to a bright red and placed under the drop hammer, with the punch fastened in the drop. The punch was then dropped upon it twice, which resulted in bringing up some of the lines and curves. The die was then removed and worked out by hand, removing, as far as possible, all surplus stock. It was then reheated and the drop was repeated. The high spots were again removed by hand, and this operation was gone through with four times, when all edges and curves were brought up perfectly. The die was then highly polished with oil and emery and set on the faceplate of the lathe, so that the outside of the finished impression *V V* was true. The hole *W* for the pad or knockout *X* was then bored and reamed, with a shoulder in the bottom for the pad *X* to rest on.

Before hardening the die, several templets for the blank were got out by hand, and were then struck up until the exact size required was found. Two templets of each size were made, one to be struck up, and the other to work by. The gage plate E, of flat cold-rolled steel, was bored to the diameter of the blank, and the die was reduced and trued at the outer edges, to locate the gage-plate *E* true with the die proper, the two screws *B B* holding it in position. The die was then hardened and drawn slightly, leaving it as hard as possible, without danger of its cracking or chipping. The cast-iron bolster was then made, and a pin *F* let in for the die to locate against. The pad or knockout *X* was of tool steel, hardened on the face. A

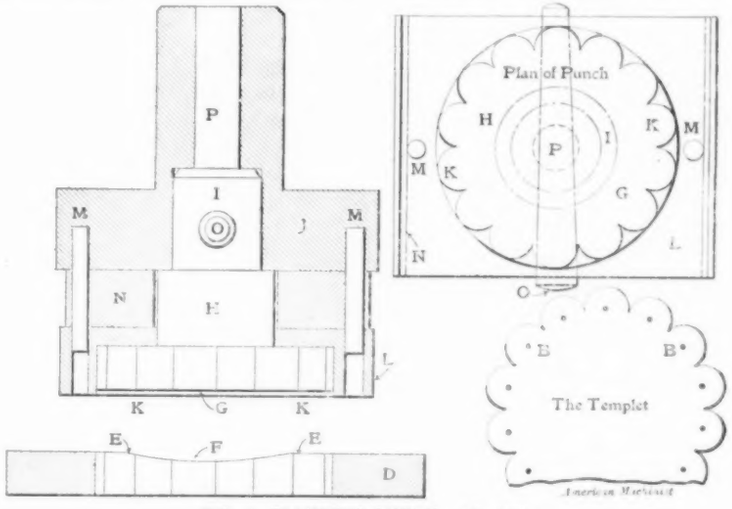


FIG. 2. BLANKING PUNCH AND DIE.

hole was bored straight through the bolster, to admit the spring *Z;* the two jamnuts *Y* on the knockout *X* allowed of adjusting the hight of it. The hole in the bolster was tapped to admit the sleeve *G*, which was screwed in tightly, and allowed the spring *Z* and the washer *H* to rest within it. The headless screw at the bottom was for adjusting the tension of the spring. The blank holder and spring pad are located on the punch, which is a far simpler and cheaper way of doing it, whenever possible, than the other way of locating them on the die.

The blank holder *J* is of cast iron, bored to fit the outside of the punch at *R R* snugly, and at the top to fit the part *S* and shoulder against the back of the punch. It is turned on the outside to just fit into the gage plate *E*. For the pad, a piece of flat hard spring rubber *K* is used, and is held between the blank holder *J* and the face of the punch holder. The punch is fastened within the holder by a hardened taper pin, through the hole *T*. The rubber *K* was compressed so that its pressure would hold the blank securely directly it came in contact with it.

The finishing punch and die being complete, and a perfect blank finished to the exact size, we were then ready for the blanking die. In finding the blank, and in making the die for an irregular edged shell, more skill and care are required than in a plain circular blanking and drawing die.

The die *D*, Fig. 2, was made first of ½-inch flat annealed tool steel. It was not necessary to use heavy stock, as the metal to be punched was very thin. The templet was soft soldered to the center of the face of the die, then a small drill, about No. 60, was used, and the centers *B B* of the scallops were drilled through to the face of the die, running in about ⅛ inch. The templet was then removed, and the holes in the die *D* were enlarged and drilled through. They were then reamed to fit the tit of a counterbore. The counterbore was about .010 inch under the finished radius of the scallops. The holes were then counterbored, after which a reamer of slight taper was let in from the back, and the holes were reamed to the exact size required; that is in exact duplication of the scallops of the templets. After the first hole was reamed to size, a soft steel plug was driven in and the next hole was reamed, when a plug was driven

into it also, and so on until all fourteen holes were finished. The plugs were then driven out, and the center of the die came away with them. This resulted in sharp edges where the scallops joined each other. The taper of the reamer used for finishing the holes was barely a half degree, which left the die almost straight and allowed

is entered into the holder and faced up (in the vise) until the taper pin *O* can be entered and driven in. The die *D* is fastened within a plain bolster, and the metal to be punched is held on the face of the die. As the punch descends, the stripper *L* holds it securely while being punched and strips it from the punch as it rises.

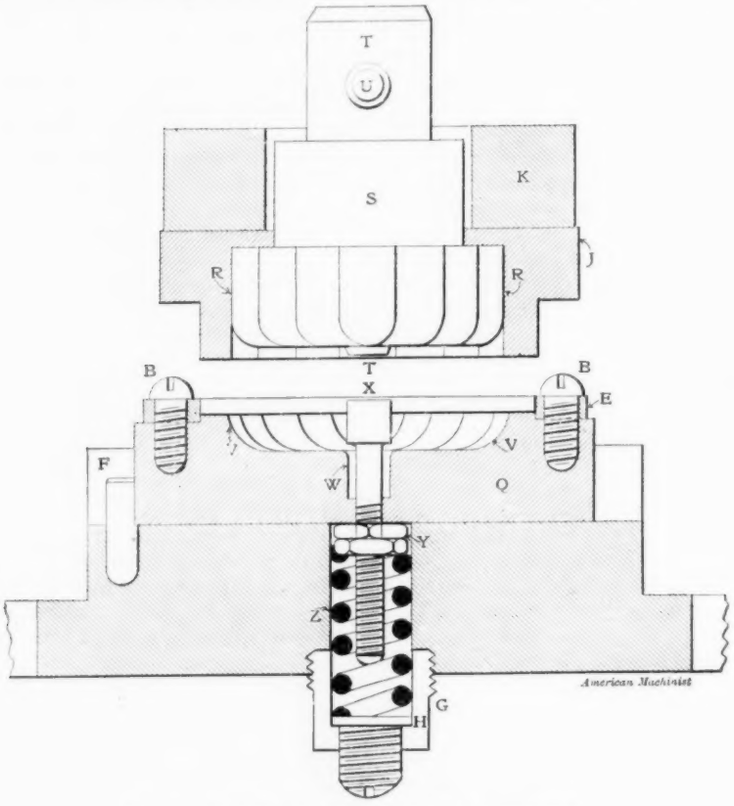


FIG. 3. PUNCH AND DIE FOR SECOND OPERATION.

the face to be sheared at *F* and to be ground when dull, without materially increasing the size of the blanks. The die was then hardened and drawn to a light straw temper, and the face was ground and oilstoned.

The punch G was first turned to fit within and shoulder against the face of the holder *J*, which was of cast iron and was used for both operations. After the outside of the punch at *K K* was finished to a size slightly larger than the diameter of the die, the scallops were indexed and milled, allowing a slight surplus of stock at all points. The edges of the scallops at the face of the punch were beveled slightly, and the punch was then sheared into the die, thereby making an impression at all points. The surplus metal was removed, and the punch was thus gradually sheared through the die. It was then polished and left soft, as it was necessary for it to fit tightly in the die to produce blanks without burrs. The stripper *L* is of cast iron, bored to fit around and to shoulder against the back of the punch. The two pins *M M* keep it from shifting. *N* is a piece of hard spring rubber.

When in use the punch, with the stripper *L* and the spring rubber *N* in position,

When using the finishing die, Fig. 3, the blank is laid within the gage *E*, and as the punch descends it is held securely by the blank holder J while being drawn and formed into the die, the punch bottoming in the die with a good hard blow to bring up all the edges sharp. As the punch rises, the pad *X*, or knockout, strips the shell from the die and delivers it at the top.

Electrogravure — An Electro-Mechanico-Chemical System of Die Sinking and Engraving.

We take pleasure in calling the attention of our readers to a novel process for automatically cutting away steel surfaces in irregular and delicate shapes, as in the sinking of embossing dies, which is one of the most tedious and exacting of hand-executed operations now surviving, and which up to a recent date there has been little prospect of superseding by mechanical means. The machine employed in the process is shown in the cut, Fig. 4, and while nothing can be done without it, the work that is done by its aid is still not strictly mechanical work as understood by our readers, as no cutting tools are em-

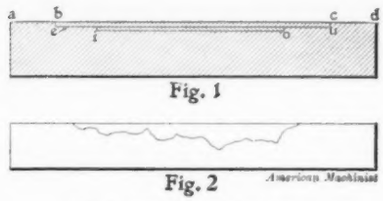


Fig. 1

Fig. 2

THE ETCHING PROBLEM.

ployed, and there are no chips or shavings such as cutting tools make. The metal, however, is removed from the places and in the volumes required. The work done is entirely reproductive. There must first be a model to work from, so that the artist or originator is not in the least done away with. The artist or designer, however, may model in wax or in clay, or in any plastic material from which a plaster cast may be made. The machine insistently calls for the plaster model, and having that it is ready for business.

The operation as now conducted is, when clearly understood, an extremely simple one, and it gives little suggestion of the tedious and protracted series of experiments, with the usual accompaniment of failures and of partial successes all along the way, by which the results desired were reached.

We are all sufficiently familiar with the operation of etching. It may be done by purely chemical means or by electrolysis. In either case the parts of the surface not to be acted upon must be protected by a suitable covering, and the results produced by a simple etching process must be quite limited. In Fig. 1, having the surface *a d*, if *a b* and *c d* be covered, then we can etch *b c* to a uniform depth, and then if *e i* and *o u* are covered we may etch *i o* still deeper; but if we wish to etch as indicated by the irregular outline in Fig. 2, the process is evidently inapplicable.

The inventor of the present process therefore went at the problem in another way. He succeeded in producing a liquid surface which exactly matched, in reverse, the profile or outline to be etched. Fig. 3 is intended to show the principle. Here is any suitable receptacle containing a solution of ammonium chlorate as an electrolyte, into which is dipped a plaster cast of the relief to be etched. Beneath the plaster is led a coil of wire as a cathode. The steel plate to be etched is inverted and supported above the plaster cast, and this plate is connected with the positive current. After the pores of the plaster have

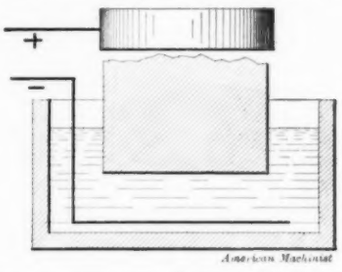


FIG. 3. THEORETICAL ELECTROGRAVURE.

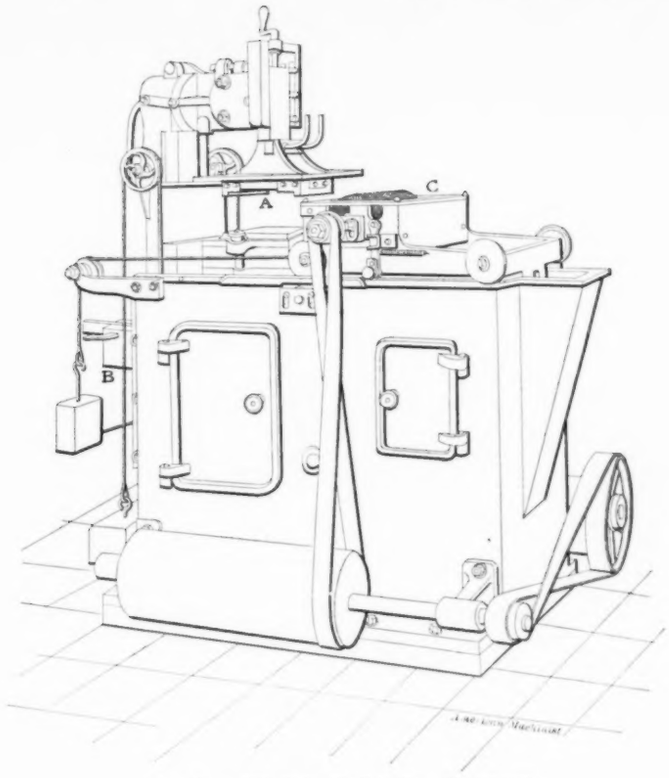


FIG. 4. THE ELECTROGRAVURE MACHINE.

absorbed the electrolyte a liquid relief surface is opposed to the surface of the steel plate. This liquid, however, will only act upon the steel at the points of contact with the plaster which carries the liquid. If the electric current circulates in the direction arranged for, the result will be that chlorine is set free at the steel plate. This combines with the iron and enters into solution as chloride. Iron is thus dissolved at all points or surfaces of contact; the steel plate is thus deprived of its support and must sink deeper and deeper upon the plaster, or the plaster penetrates deeper and deeper into the steel.

It has been found that the model and the plate must not be in continuous contact with each other, as above seems to be suggested. The carbon, which is a constituent of the steel, here comes in as a factor. This carbon and some other mixtures with the metal are not soluble by electricity and must from time to time be removed by mechanical means, the carbon appearing as a powder between the plate and the model. The surface of the plaster model also requires attention. On this surface the chlorine is soon used up, and for this reason also the steel plate requires occasional removal, this action permitting the supply of the fresh electrolyte. It need not be said that the removals and the replacements must be done with precision, the former not of course being essential except as securing the latter.

It was necessary, to make a commercial success of it, that the operations involved should be automatic and continuous, and the result was the machine shown in Fig. 4. All the necessary operations are provided for in this machine. It is not necessary to describe the construction of the machine in detail. The perfecting of it has involved inventive skill of a high order, as will be understood from a simple description of its operation. The plate or die is clamped in the chuck at *A* with the face downward. The chuck may be adjusted vertically and also may be tipped or inclined both laterally and longitudinally to correspond exactly with the face of the model below, and then is fastened securely. The plaster model is placed face upward upon a vertically moving carriage directly below the plate. Supposing the model to be already saturated with the chemical solution, it first rises until it touches the plate and remains in contact with it for about 15 seconds. The touching of the plate, especially at first, when there may be only a few points or even a single point of contact, must be done slowly and also with very light pressure, so that the plaster may not be crushed. Accordingly the model is suspended in the carriage upon the end of a horizontal lever the other arm of which projects at the back of the machine and carries a weight *B* which may be moved inward or outward, according to the pressure required. After the engraving operation has continued for some time, so that a larger surface of the model comes in contact with the plate, the weight may of course be moved to give a greater pressure. Upon the expiration of the time allowed for contact the carriage descends with the model and remains at rest for a short period. While it is thus resting the carriage *C* moves under the plate and back again. This carriage carries a rapidly revolving brush driven by the upright belt in front, and in advance of the brush is a horizontal tube discharging numerous jets of compressed air against the face of the die, these jets only discharging during the backward

FIG. 5. A PLASTER MODEL.

travel of the carriage, the air and the brush effectively cleaning the surface. The carriage also carries a roll of sponges saturated with the chemical for at the same time recharging the face of the model. When the carriage *C* moves back to its former place the model again rises to contact with the plate, and so the operation goes on.

The positive and negative wires are of course connected to the plate and to the model respectively, as previously explained. The current employed is only from 12 to 15 volts, the strength of the current being self-regulating according to the extent of surface at the time in contact. With plates of, say, 8x12 inches, which this machine will take, it may rise to 50 amperes when nearly the entire surface is in contact. The contact of the model cannot be made so gentle that the delicate projections of it do not suffer more or less, so that more than one plaster cast is made, and in the making provision is made for accurately locating each to fit in the place of the other.

A most important question is as to the speed at which the work is done. The steel, of course, is not cut as rapidly as could be done in a die-sinker or a milling machine, where the only consideration is the making of as many chips as possible, and in many cases, where large surfaces are to be excavated to considerable depths it will pay to remove the bulk of the metal by mechanical means, but still the process is not a slow one. It may be stated in a general way that the model will penetrate the steel at the rate of about 1-16 inch per working day. A most important feature of the process is that it is equally effective upon the hardest steel, so that dies may be hardened or tempered in advance, and there is not the least risk of loss by breaking or cracking or warping in hardening.

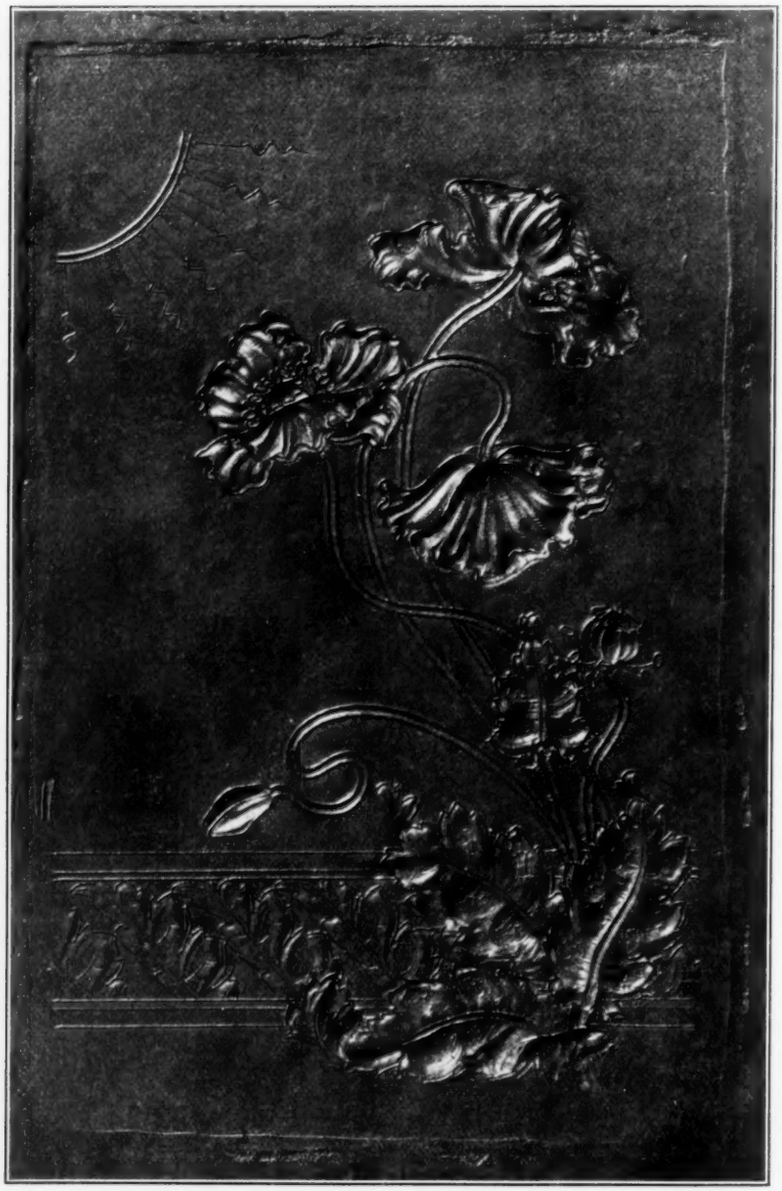


FIG. 6. FACE OF DIE PRODUCED BY ELECTROGRAVURE.

It will be seen that the process is of wide applicability, especially for dies so extensively used by silversmiths and other art workers in metals, for embossing paper, leather and similar stock, and for any elaborate and artistic designs to be reproduced in relief. As to the perfection of the reproductions these must be seen to be appreciated. We show here in half-tone a die which has been produced by this process and which has not been retouched by hand, also a plaster model and an impression from a die, different subjects being selected for each to give a better idea of the scope of the process.

The process and the machine are of German invention, and they have been in use sufficiently long to have fully demonstrated their practicability and high economy. We have had the pleasure of seeing the machine in operation and numerous specimens of its work. Anyone interested may see the machine doing its work by applying to Herman C. Rost, secretary of the Electro Gravure Machine Company, 218 William street, New York city.

The Experience of an American Shop Manager in England.

Mr. W. H. Pike, Jr., who nearly four years ago left St. Louis to go to Nottingham, England, there to establish a factory for the manufacture of the Burroughs computing or adding machine, has recently returned and gives a very interesting account of his experience with the British workmen and of manufacturing in England. He speaks in very high terms of English workmen and says that within one year from the time of arriving there he was manufacturing the machine of as good quality as it had been made in St. Louis and at lower cost. This, however, was done with an equipment of machine and shop tools which had been made in America, the latter by the Boyer shop in St. Louis, the equipment and the methods followed being as nearly as possible precisely alike in the American and the British shops.

Mr. Pike early recognized that the British workmen had certain ways and ideas different from those prevailing in America, and knowing that these ideas were based upon generations of usage he especially avoided running counter to them more than was necessary and particularly refrained from criticising their customs or ways of doing things in a manner that might be unpleasant. On the contrary, he fell in with their ideas so far as possible or consistent with the plans he had in view, at the same time making it a point to see that a situation in his factory was made more desirable for workmen than any other that could readily be found in the vicinity. He found this to be fully appreciated and said

that he got excellent men, among them first-class toolmakers who knew how to do a good job. Some of these had received their training in a watch factory of the vicinity and this training had been most excellent. They were capable of doing very high-grade tool work.

As to the difficulty of handling the men, which is often referred to, Mr. Pike found very little of it and declares unreservedly that he should, as a result of his experience there, expect now to be able to handle employees in a British factory with rather less trouble than he should experience in handling a corresponding lot of men on Long Island or in the vicinity of St. Louis, where his experience here had been chiefly gained.

At first the hours of labor in the Nottingham factory were made to conform to those generally prevailing in England. That is, the men went to work at some unseemly hour (which we have now forgotten, but which is much earlier than here), then stopped for breakfast and again several times during the day. After something over a year of this the hours were changed to conform to the practice here, and it was found that after the men became a little accustomed to the new order of things they liked it much better than the previous plan.

Then, in regard to material for manufacture, Mr. Pike states that he had no difficulty. Of this he had been warned beforehand that it was difficult to obtain uniform and good sheet steel and drawn Bessemer rods such as are desired for use in automatic screw machines, but said that he found no difficulty in obtaining such things in Sheffield or Birmingham of fully as good quality as could be had in America. He used in his screw machines English mild steel bars that were round, uniform and of such quality that he ran them at 150 feet per minute cutting speed, with very common lubricating oil upon the tools.

FIG. 7. IMPRESSION FROM AN ELECTROGRAVURE DIE.

Mr. Pike related an instance of a railroad director who, visiting the factory, asked if all the men whom he saw at work were Americans, he thinking that they were, and in fact not recognizing them as British workmen, the reason for this being that they had fallen into the American practice; the shop was clean and the men were clean; they wore aprons and were neat and looked more like American shop workmen than those commonly found in British workshops. In short, Mr. Pike is strongly of the opinion that in every way the British workman would be found to respond to good treatment and that he is efficient, fair-minded and a good fellow in every way. He believes also that while there are a number of progressive manufacturers in Great Britain who are ready to go ahead and take up new ideas, there are many others who have held back for years and are still holding back, and relates an amusing instance of a man who sued his employers for damages resulting from an accident with a machine. He was working in an engineering establishment. In the course of the trial it was brought out that this man had been in the employ of that establishment for fifty-three years, that he had operated identically the same machine on identically the same work for fifty of those years, this evidence being brought out in order to show that he should have been thoroughly accustomed to and acquainted with the work and machine so that he should have avoided the accident. It is worth remarking perhaps that this same firm is one of those who was most vociferous in its claim that no government contracts for bridges, locomotives or anything else of the kind should be given outside of Great Britain.

This testimony of Mr. Pike's, it will be noted, strongly contrasts with most of what we hear about British workmen, not only from Americans who have been over there, but from British employers as well. Nevertheless, we have every reason to believe that Mr. Pike states his experience accurately, and it only goes to show once more that there are nearly always exceptions to a general rule. Even in the matter of "stopping out" Mondays, Mr. Pike stated that he had no serious trouble from it, the men very generally coming to work as promptly and regularly Monday mornings as on other days of the week.

It is reported that the machinists employed by John A. Roebling's Sons Company, of Trenton, N. J., have declared a strike because the company proposes to return to the sixty-hour week, having granted the demand for the shorter day last spring. The men now claim that the company has not kept faith with them.

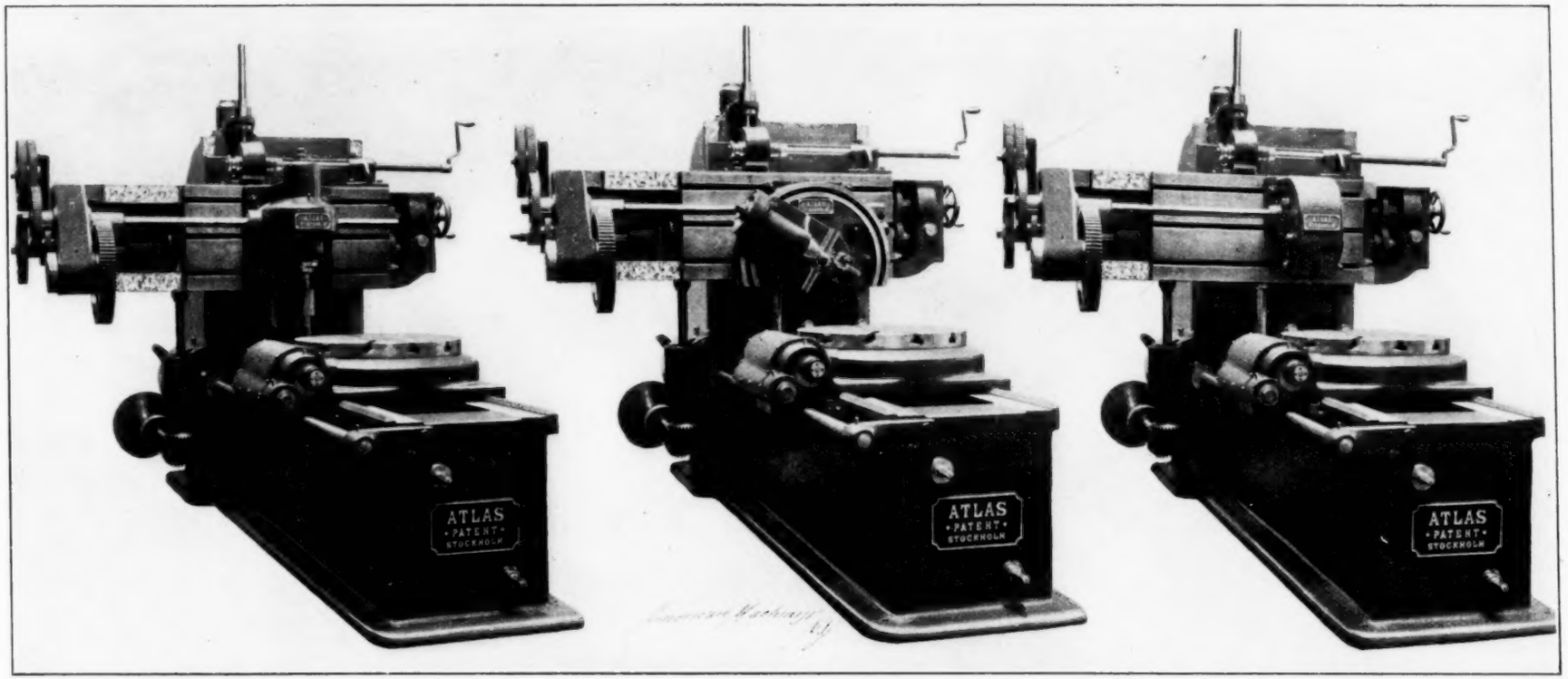


FIG. 1. ATLAS MILLER FITTED FOR ORDINARY WORK.

FIG. 2. ATLAS MILLER WITH HEAD FOR SPIRAL GEARS.

FIG. 3. ATLAS MILLER WITH HEAD FOR MILLING INTERNAL TEETH.

A Swedish Miller and Gear Cutter, Boring Machine and Variable Speed Countershaft.

In our issue of March 10, 1898, Prof. Sweet described some of the tools made by the Atlas Works, of Stockholm, Sweden, and among them a worm-wheel hobbing and gear-cutting machine of large size and excellent design. We have recently received some photographs, blueprints and a letter from the Atlas Works, and quote from the latter as follows:

"Referring to our earlier correspondence and the great interest which was taken in our patented gear-cutting machine of which an account was given in your paper at the time (March 10, 1898), we take for granted that our progress since then in the same line will be of interest to yourself as well as to the readers of your valued paper.

"Enclosed please find photographs of attachments for cutting various kinds of gears. Fig. 1 shows an attachment for regular milling work. Fig. 2 shows an attachment for cutting spiral gears, and Fig. 3 shows an attachment for cutting internal teeth. The photograph of the gearing [Fig. 4] shows samples of gears cut out in a solid ring 4 feet in diameter; on the outside there are three different kinds of teeth and on the inside you will notice internal teeth besides the milled grooves. It is a pretty piece of work, and, we can assure you, most correctly cut in every respect.

"Referring to photograph of the vertical milling machine [Fig. 5], we have, as you will notice, added some new and valuable improvements besides arranging same for the use of electricty as motive power if wanted.

"Regarding the general construction, we would say that in designing same due consideration has been given to our hard-working metals. The spindle has back-gearing, automatic feed and stop, ball bearing and is balanced. In order to vary the various feeds, we have a patented arrangement of friction wheels of construction as per enclosed blueprint [Fig. 6]. The power is conveyed from the driving pulley of the spindle to the pulley of the friction wheels by means of a belt. The power from the upper to the lower friction wheel is transmitted through a movable pair of friction rings with leather packing. By turning the handle shown in the plan [cross section] the friction rings get the various distances from center of the spindle and the lower friction wheel gets corresponding speeds. This arrangement will enable you to get any speed between

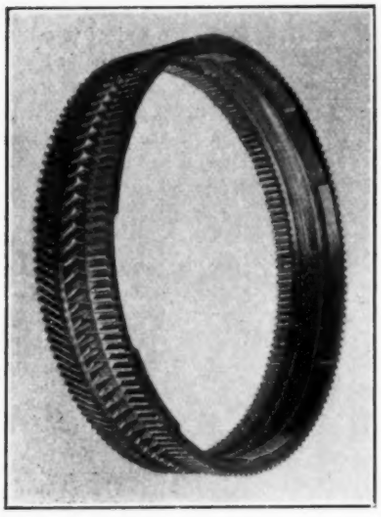


FIG. 4. AN EXAMPLE OF WORK DONE.

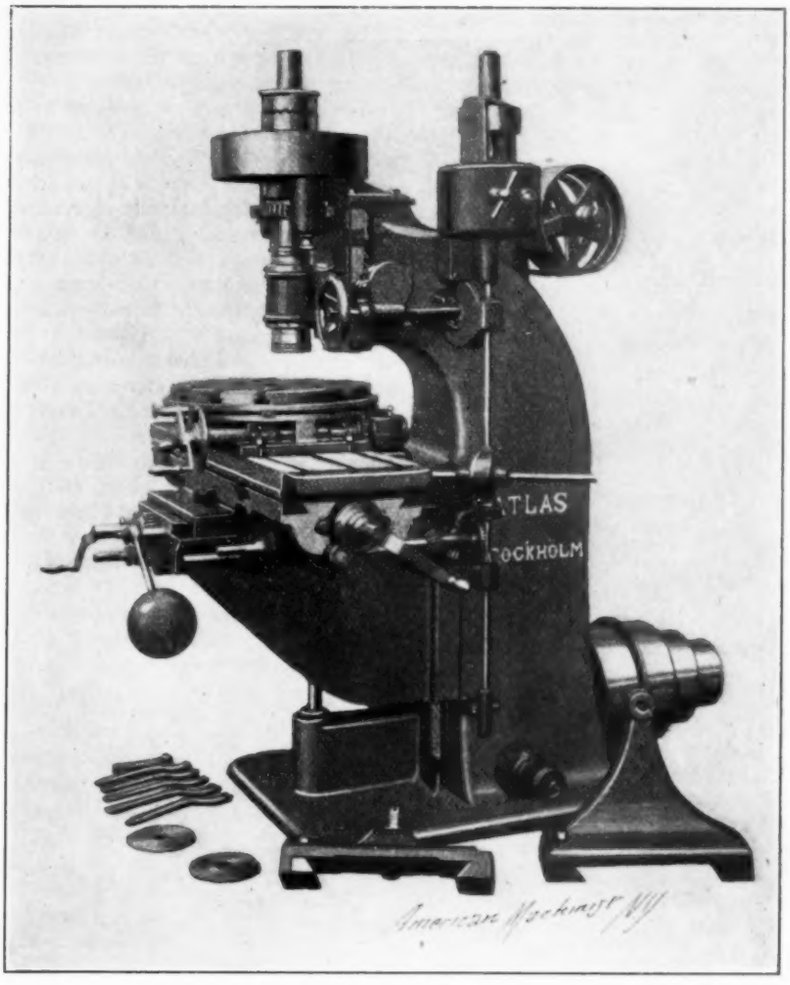


FIG. 5. ATLAS VERTICAL MILLER.

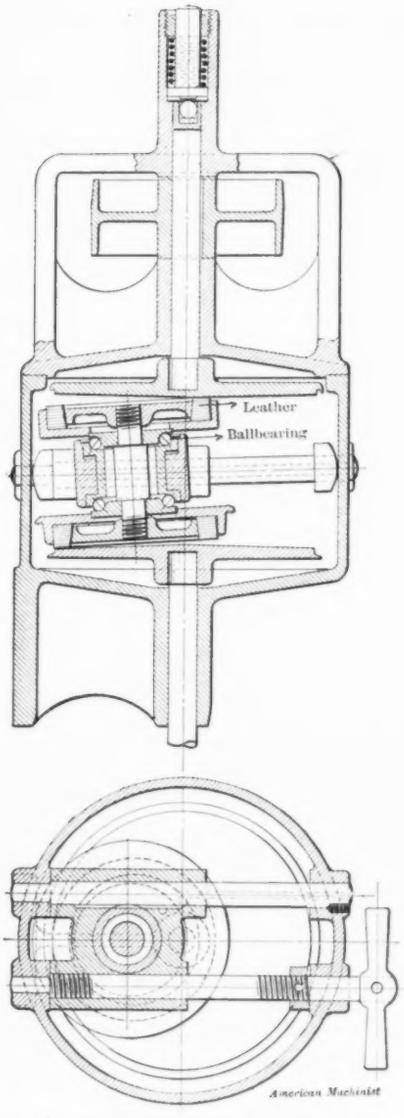


FIG. 6. LONGITUDINAL AND CROSS SECTIONS OF ATLAS VARIABLE SPEED COUNTERSHAFT.

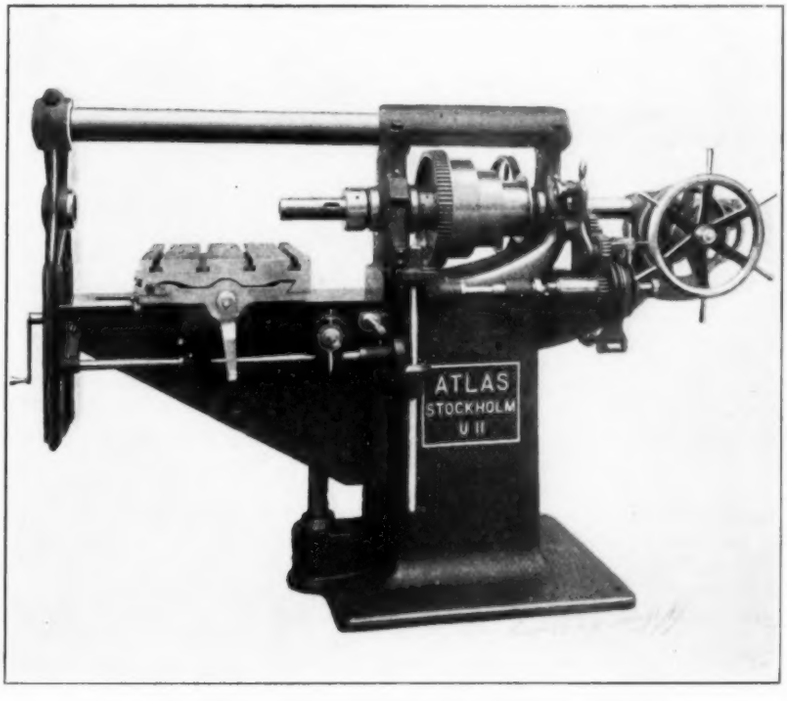


FIG. 7. HORIZONTAL BORING, DRILLING AND MILLING MACHINE.

limits. As mentioned before, the power required for the feeds is taken right off the main spindle and on that account prevents all possible breakage, as both the feeding mechanism and the spindle stop at the same time in case the bolt should break or slip.

"The revolving table is provided with indexing mechanism, a feature not found on any other machine of this type. In connection with above, we have also equipped the machine with an automatic profiling attachment. The templet is fastened on the table and held against the guide-pin by means of a weight; the table

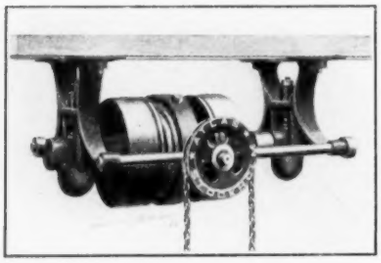


FIG. 8. ATLAS FRICTION VARIABLE SPEED COUNTERSHAFT.

is provided with a special feeding arrangement for profiling work. All handles are within easy reach from one place, which makes manipulation and adjustment exceedingly convenient.

"The main dimensions are as follows: Automatic vertical feed of spindle, 7 inches; automatic vertical feed of table, 16 inches; automatic cross feed of table, 13 inches; automatic longitudinal feed of table, 40 inches; size of table, 13½x55 inches; size of revolving table, 22 inches diameter; distance from center of spindle to frame, 16 inches; greatest distance from end of spindle to table, 22½ inches; weight, about 3,150 pounds.

"The photograph of the horizontal boring, drilling and milling machine [Fig. 7] shows a rather new type of this kind of machine, and which, besides being designed for the same class of work as done on the Bement type machine, also is fitted with a vertical milling attachment. As will be seen, the main frame and table are extra heavy, and the aim has been to prevent any possible springing, in order to maintain original accuracy. The spindle is of the best steel, has back gearing and is mounted in a sleeve with provision made for clamping the two together when the machine is used for milling work. It has both quick and slow hand motion and any rate, between limits, of automatic feed. The same patented arrangement for varying all the feeds, as explained in connection with the vertical milling machine, is also used here. All the feeds are reversible and easily detachable.

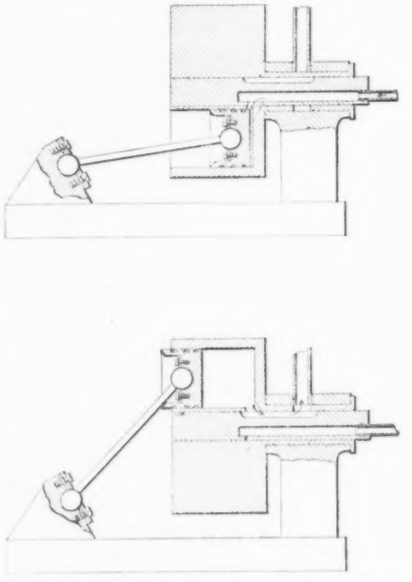
"The principal dimensions are as follows: The table is 20x32 inches, with automatic crossfeed of 20 inches and automatic stop. The vertical automatic feed of the table is 21 inches. Greatest distance between center of spindle and table is 21 inches. Length over all is 8 feet, and total weight is about 4,600 pounds.

"The photograph of the countershaft [Fig. 8] shows the before-mentioned arrangement for varying the feeds, as applied to a countershaft. The two friction wheels are, in this case, cast together with their respective pulleys, and the motion of the sliding pair of friction rings is effected by means of a chain wheel with chain. As will be noticed, there is no loose pulley, as none was required in this particular case; but on same styles of countershafts used for regular work, a loose pulley and clutch for reversing are easily added. The advantages with this arrangement are: Any variation of speed between limits, the desired speed obtained only by pulling the chain, and it occupies less space than the ordinary countershafts.

"Especially for smaller machines this countershaft has proved very much superior, and by degrees it is our intention to apply it wherever we can."

The Latest Rotary Engine.

It seems to become more and more difficult to limit the possible development of the rotary engine, or to determine in advance the shapes which it may or may not assume. The cut herewith, adapted from



THE LATEST ROTARY ENGINE.

a recent United States patent, shows a practicable rotary engine and a mechanical novelty. It is, by the way, also a good example of simplicity of design. The entire engine consists of but three working parts. Anyone can easily see how the device works, and no one can deny that it will actually work. The admission and discharge of the steam is effected through the trunnion. When in the position shown in the upper figure, steam is admitted behind the piston the thrust of the ball-ended connecting rod against the anchored thrust block at the other end of it carries the cylinder around, if it is helped over the center, to the position shown in the lower figure. The steam is then released and the momentum of the revolving cylinder carries it around to its first position when steam is again admitted, and so it keeps a-going. The principal drawback of the usual rotary engine, the packing of large and rapidly moving surfaces against the steam pressure is gotten rid of, and only the usual problem of the ordinary reciprocating engine is encountered. The admission of the steam may evidently be so controlled as to use the steam expansively, which is another feature not often to be found in a rotary engine. It is a question, however, if this is not more of a reciprocating engine than a rotary one, and if the promising features of it are not due to its being a reciprocating engine. The inventor is Major J. Robinson, Los Angeles, Cal.

Letters from Practical Men

The Great Coal Saver.

Editor American Machinist:

These are about the last days of the Pan-American Exposition, and soon we must clear the thoughts of it out of the way to make room for other novelties. Before it drops clean out of sight, and soon also out of memory, it may be well to note the thing which it most emphasized. Whatever it was intended to be, the show was more than anything else an advertisement of Niagara Falls. And this is singular, too, for if there is anything in the world which might be thought to require no advertising it surely is the great cataract. Still, the status of Niagara in the popular thought is affected by this advertising, and on account of it many more people than usual are doing more thinking than usual about the world's greatest waterfall, and especially about the work that it may be made to do for us. The visitor to Buffalo is simply compelled to think of this. The Exposition is unique in the fact that it is the first of the modern industrial exhibitions in which the steam engine has had no chance. The steam engine exhibit was in this case thought of so little importance that in the earlier days of the Exposition the complaint was that it was difficult even to find it; and no wonder. Nearly all the power required for every purpose came from Niagara, as did the transformed power in the magnificent electrical illumination. It is, after all, not Niagara but electricity that the Pan-American Exposition has insistently magnified, and electricity in its function of power transmitter.

Many other instances have come into recent notice of electricity's service in power transmission, not only in large quantity but also for great distances.

There is a transmission of 4,000 horse-power 80 miles from the San Bernardino Mountains of California to Los Angeles, and this is far surpassed by the transmission of a much greater power from the upper waters of the Yuba River to San Jose, which is 184 miles. Then there is the great Massena plant which takes the waters of the St. Lawrence above the Long Sault Rapids and leads them through a 3-mile canal and gets a fall of 45 feet for an immense volume of water and a total available power too big for my memory. All these power plants, and innumerable others, are made available or can be made available for our everyday uses by electricity. They put a dam across the Hudson at Mechanicsville, and, without much of a fall for the water, they have all the power they want to use at Schenectady and they run the trolley cars of Troy and Albany.

The use of electricity in connection with the utilization of great water powers, or of those remote from the haunts of man, is now such an obvious and established fact that it makes one laugh if it is not immediately thought of where the conditions for its employment are disclosed. There is a curious case that has come to my notice within a few days; the "Dixie Miller," I think it is, tells about it. The Harpeth River, in Tennessee, has a most tortuous course, and in one part it runs 7 miles and then comes along within 80 yards of its former channel. A tunnel has been cut through this short distance with a section of 16x6 feet, which the river is more than able to fill at all times, giving a fall of 16 feet and making, perhaps, 1,000 horse-power immediately available. They are looking now for a chance to employ this power, and here is where the laugh comes in. There is the city of Nashville within reachable distance, and there is electricity. What more need be said?

Some of us old fogies were disgusted at the airs which we thought electricity was putting on only a little while ago. There was a lot of talk, which certainly had a strong flavor of foolishness about it, of electricity superseding steam for driving things. We had to get up and look wise and assure our visionary friends that they were altogether too fast, because behind every dynamo there must of necessity be a steam engine, and where electricity was showing such ready facility for doing so many things, and getting for power so many new lines of employment, it was really vastly increasing rather than diminishing the demand for the steam engine and for the coal to drive it. But even here electricity began at once to show itself the coal-saver. As now the great transmitter of the power derived from coal, while it has undoubtedly led the civilized world to develop many more uses of power, and to demand power in larger quantity, it has at the same time proved itself a great saver of power in the very act of transmission, by eliminating the great friction losses always chargeable to other agencies, and it has at the same time made it generally possible to develop the power more economically, or to obtain a great increase of power developed from any given coal consumption. The large power-house, with its comprehensive and all-embracing economies, has driven out the small and wasteful steam engines, stationary, portable and locomotive, and effected an enormous saving both in coal and in labor.

When it comes to the utilization of unusual water powers everywhere which electric transmission has made possible, the thing speaks for itself. What has been done by it in this line is only a sample of what it can do and the promise of what it will do. The flow of Niagara has not been perceptibly diminished by all the water that has yet been drawn from it for power purposes, so that here alone the power development has only made a feeble beginning. Then there is the St. Lawrence, through which all the waters of Niagara flow, with its numerous rapids each of which speaks of electricity's opportunity; there are the other great rivers and the smaller streams with deeper plunges not yet harnessed to our work, so that the great coal saver has in this line only as yet just begun its task.

It surely is not too soon to put the great coal saver at work right at the mine, just as at the waterfall. A great item of the work of the railroads is the carrying of coal. Of the coal transported the greater portion of it is for power purposes, so that coal transmission is power transmission. Some lines of railroads exist and are operated almost entirely for this style of power transmission. Which is better for the transmission of power from the mines to the power houses of our towns and cities, or, say, rather from the mines to the trolley lines, the lighting stations and the factories, the railroad line and the frequent coal trains going and returning, or the line of electric wires?

It is a great thing that when such schemes as these are in these days talked of, no costly or risky experiments are necessary to settle them. They call for nothing but reliable computations. Nothing, perhaps, is more marvelous in connection with our great modern coal saver than the precision of the knowledge of what it will do and at what cost, and the reliability of the assurances of its familiars. It really is for them to say, rather than for me, what the coal saver can do.

TECUMSEH SWIFT.

Sulphur in a Blacksmith's Fire.

Editor American Machinist:

In the twenty-four years that I have been reading the "American Machinist" I have no recollection of seeing anything in its columns about preparing a fire on a blacksmith's forge for welding iron or steel, etc., by sprinkling common sulphur or brimstone in the fire. I consider it a late day now for that "useful patent" that you tell us about on page 1088.

Note the following: In the year 1863, in the Lake Shore blacksmith shop in Cleveland, Ohio, there was a man employed to repair a lot of anvils, some with the horns knocked off and others with part of the steel face gone. In the operation, after fixing the fire to suit the job, he used the following ingredients: Sal ammoniac and borax, of each 2 ounces; saltpetre and brimstone, of each 1 ounce; all pulverized. After throwing ½ ounce of this mixture into the fire, it was ready to commence work, and thereafter every two hours he threw in the fire the same quantity.

I may now as well give the ingredients for welding the steel on the face of the anvil, also for hardening the face of anvil. For welding he used the following: Borax, 1 pound; sal ammoniac, 3 ounces; calcined magnesia, 1 ounce. Pulverize and mix, and use as borax is commonly used.

Preparation for hardening the face of anvil: Prussiate of potash, ½ pound; saltpetre, 1 pound; gum camphor, 1 ounce; sal ammoniac, 2 ounces; salt which has been used in pickling mackerel, 3 pounds. Pulverize and mix. Put on each face when at a cherry red heat two tablespoonfuls. Cool at once.

Now, Mr. Editor, from the above, which is absolutely true, can it be possible to stop any person from using brimstone in a blacksmith's fire? Perhaps it may be well for others to know the above as well as myself.

GEO. JONES.

Chattanooga, Tenn.

[What on earth does anyone want to throw sulphur in a blacksmith's fire for?—Ed.]

Writing for Catalogs.

Editor American Machinist:

I notice on page 1106 an article on "Replies to Requests for Catalogs, etc.," and I would like to strongly emphasize what the writer says. The firms that manufacture tools, and want to sell them, make a grand mistake when they refuse to send their catalogs to those insignificant fellows that *work* in the shops. I am positive that Brown & Sharpe owe a great deal of their success to that little blue book that they send so generously to any and everybody that ask for it, and which describes so completely their different machines. That little book in my hands has brought one of their surface grinders into the shop where I am employed. Slocomb's catalog brought a set of their micrometers, besides between one and two dozen of their small micrometers to the men. Rivett's bench lathe catalog, a nice and expensive book indeed, brought one of their bench lathes, with most of its attachments, into our toolroom. A couple of years ago I wrote to a well-known firm for a catalog of their punching machines, but received no answer. I think I wrote again a few weeks later, but no answer. Then I wrote that

the firm that I worked for contemplated buying a punch press for a certain line of work. This brought a catalog and a good deal of special information, b t by the time it arrived the order was already placed with another firm. The next time we wanted presses I talked up the same press again; I knew something about them then. I could tell something about their capacity, the upper and lower knockout arrangement, the feed, etc., etc., and the result was (I imagine, anyway) that two of their machines landed in our shop.

The superintendent or foreman in a shop has little time when at home to study up *all* the particulars about *all* tools and machines that are wanted in a shop; but a bright lathe hand or milling-machine hand or a toolmaker will study up some particular machine that he has seen in a catalog and present some of its details and good points to the foreman or superintendent in a ten minutes' talk that it has taken him an hour or two to find out himself, and which would have consumed as much of the foreman's time, had he studied it over; but here he gets it concentrated and illustrated by the work in hand, and the thing is plain at once, and the machine is ordered.

Here comes in the principle that is put in practical use at Dayton in the cash register factory: that one hundred pairs of eyes will see and one hundred brains will think of things that one never would. If only those one hundred were given a chance, or, still better, a reward for their practical suggestions.

What a pity it is that our manufacturers don't take up that reward system. How many hundreds of profitable suggestions they would draw out of good, intelligent brains that are now inactive or active in things that are injurious to themselves and to their employers. These rewards would create good feeling towards the heads of the firms, and there would be less of an ear for strikes and anarchistic ideas.

TOOLMAKER.

Points on Jig Making.

Editor American Machinist:

Fig. 1 illustrates the method of procedure in putting the bushing holes into a long jig. There were a large number of holes, and they were in sets duplicated at regular intervals for the length of the jig. The method adopted to facilitate putting in the holes was as follows: There were shoulders on raised strips *A B*, Fig. 1, between which the holes were to be located. A templet, Fig. 2, was made of a width to just fit between the strips and long enough to contain one set of the holes and the nearest hole in the next set. The holes of a set were then carefully located and bored in the templet and another hole the required distance away for the first hole in the next set. The templet being completed, it was put into the jig, and, using a spotting drill, a straight drill and a rose reamer, the holes of the first set were drilled and reamed in the jig. The templet was then pushed along until a nicely fitted plug would go through the holes *b'* and *a'*, when it would be ready to drill the next set of holes, and so on. The holes shown are the size they were bored without bushings.

Figs. 3 and 4 show one way of fastening work into a jig when there is not much room. *A* is one corner of a jig *B* is the clamp, which, it will be seen, is slotted to allow it to be drawn back from the work. The back end of clamp *B* is supported by the jig casting through which it goes. The spring shown keeps the clamp up in place to facilitate putting work in the jig.

Figs. 5 and 6 illustrate another job of jig work. As will be seen, the holes—both those parallel with the jig casting and those at an angle with it—are figured from an imaginary point, which we will call and mark A. The angular surface *a*, on which the work to be drilled is set, is machined to the correct angle; then a spot is made true on the outside of the jig at *a* that will cover the imaginary point, when an accurately ground button *B* is set, which button is to be the location from which each hole is to be put in by measurement, the button remaining in place until the bushings are finally in place and the jig tested for accuracy. To set the button, the casting was clamped to an angle-iron so that the surface *a*, Fig. 6, was parallel with the surface plate, and the button was rapped until it was the right distance from surface *a*—in this case ⅜ inch. The setting the other way was not so particular, so that the holes were the right distance apart and about in the center of the bosses through which they went; but when once the button was set, the distances the holes were from it had to be maintained. To bore the holes marked *b* the jig was clamped to an angle-plate on the milling machine, so that surface *a* was square with machine spindle both ways, when the work was set to bore each hole separately, setting it vertically, by getting the distance from the platen in the center of the button, then from the platen to a true plug in the spindle; set-

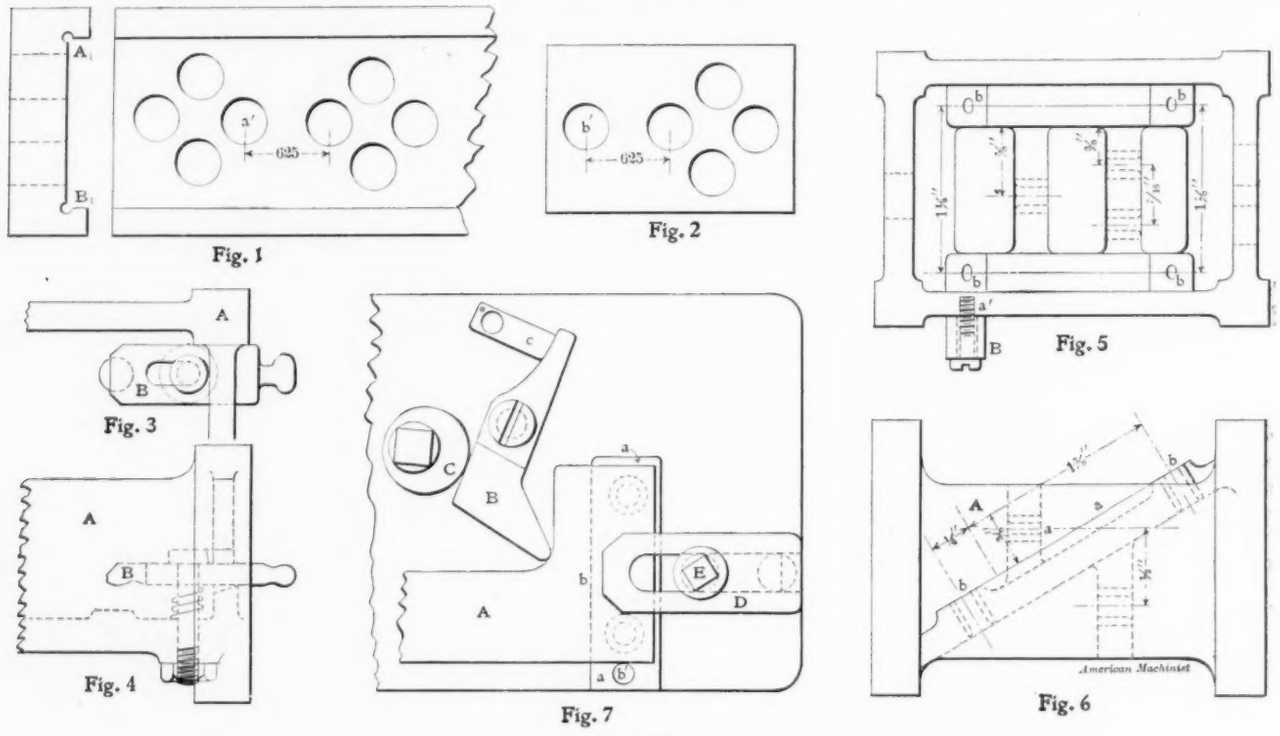


Fig. 1 Fig. 2 Fig. 5 Fig. 3 Fig. 4 Fig. 7 Fig. 6

JIG PRACTICE.

ting the machine for two holes, so that the center of the spindle was ¼ inch below the button, and 1⅜ inches above for the other two, then horizontally setting by the surface of the angle-plate to which the jig was fastened or another angle-plate bolted out to one side of the work and square with the machine spindle. To bore the holes that are parallel with the jig, it can be set on its feet square as before, and measurements can then be taken from the platen to the button and spindle and from the angle-plate to plugs in the angular holes. After the boring is done, if the job is particular, it is well to measure each hole to see if it is the right distance from the working point, as, in case a mistake has been made, and a hole is not located quite right, it will be easier to rebore it then than after the bushings are in place.

Fig. 7 shows still another method of fastening work into a drill jig. *A* is the work in place, ready for drilling; *a a* is a raised place on the jig. The work is machined where it bears on this raised place, and the planing forms a shoulder that in the drilling is forced up to the line *b*. To put the work in the jig, it is set on to the raised spot, and then by means of cam *B* and eccentric stud *C* it is forced into position, the point of the cam striking into the round corner of the work throwing it against the two gage points *b* and *b'*. The clamp D is then pushed over the work and tightened by the bolt shown. When the cam is released by turning stud *C*, spring *c* throws it out of the way, leaving room to put another piece of work in. N. A. C.

Another Expansion Punch.

Editor American Machinist:

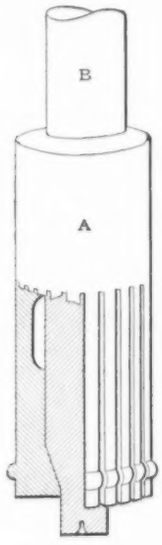
After reading and studying Mr. Woodworth's article on an expansion punch, at page 992, issue No. 36, I believe that it is not the best way to do the job he describes, and hope he will take my criticism kindly.

In the first place, a punch made in the way he describes—one center-punch inside of sixteen external and detached sections—seems very much like 16 to 1, of which we heard so much a year ago, and which idea has not been very popular with manufacturers. Expansion and 16 to 1 would not, I fear, work in the same press together. Now that the nation has concluded to have but a single standard in money, why not apply the same idea to the punch and let the sections lose their individuality, as is shown in Fig. 1, which is a much easier way to make it, and shows the job just after it has been sawed and part of the sections removed on the left side.

First make the punch shell A, then make the inner punch B. Sweat *A* and *B* together with soft solder and saw cuts into *A* on a milling machine, using *B* as an arbor and cutting through A and a little into *B*, so as to prevent fins forming on the inside of the cuts. Then melt apart and turn *B* down small enough so that *A* can contract when in use, at the same time removing the saw marks on *B*.

Mr. Woodworth does not provide a beading die for his punch, consequently the bead cannot be sharply defined or very regular, besides increasing the diameter of the work. To do a really nice job, a beading die is also necessary; see Figs. 2 and 3, which show the complete tool with punch *A* contracted. This punch and die should not cost any more than the one described by Mr. Woodworth, with no chance for the sections to get out of order. *A* and *B* are the same as in Fig. 1, while *E* is a soft shell into which *A* is driven and carries the upper beading die *C*. Punch *A* and die *C* come down together, being forced ahead by a spiral spring at the top, which must be stiff enough to hold the die *C* down while the bead is being formed. *A* and *C* bank at the same time, while *B* continues until it has expanded *A* sufficiently to make a good bead.

The recess *F* is bored in *A* to give the sections sufficient springiness and should



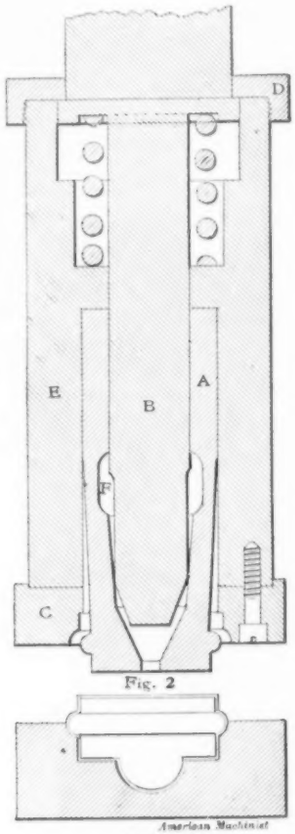


Fig. 2

Fig. 3

ANOTHER EXPANSION PUNCH.

be spring tempered at this point; all other hardened parts to be drawn only to a good yellow color. Only the working end of punch *B* need be hardened. *D* is a soft ring to hold the shell *E* against the tension of the spring. J. C. Kromer.

Elgin, Ill.

The Side Play of the Caliper.

Editor American Machinist:

In Wm. S. Rowell's article on "Side Play of Caliper," in issue No. 40, he asks where he can get a table of trigonometrical functions reading to minutes. F. Hodgman, of Climax, Mich., publishes such a table and others for which he might find use. Price is one dollar.

W. E. Housman.

[Trautwine's Pocket Book contains a table of natural trigonometrical functions reading to minutes. The writer referred to, however, asked for a table reading to seconds.—Ed.]

Editor American Machinist:

In your valuable paper there have lately appeared several articles on the "Side Play of the Calipers" for the measuring of wheel hubs and axles, line shafts, etc., each article of which is of course very interesting; but only to the few, for the average machinist who is capable of making nice fits, press fits or slip fits, there is too much reading matter to be remembered to make the fits.

I believe I can venture to say that every machinist who has pride and ambition in his trade is the owner of micrometer trams and gages to measure one-half of one-thousandth of an inch, and to them I offer the following: For slip fits, as for pullies on shafting, bore the hub of the pulley one-half of one-thousandth of an inch (.0005) larger than the shaft for every inch in diameter. For press fits there is no better rule than the one published in the "American Machinist" some time ago, as follows: Press fit, one-thousandth of an inch for each inch in diameter, plus three-thousandths for the hub to be bored smaller than the shaft or axle. Say that the axle is 7", then 7" × 1-1000 = .007 + .003 = .010 inch. Geo. Jones.

A Job of Circular Planing.

Editor American Machinist:

The article on page 1013, entitled "Turning Segments of Large Radius" reminded me of a job which came to the shop last winter. A steel segment, Fig. 1, having two dovetails was to be finished all over. A special rig had to be devised, as the radius was much too large to be turned in the ordinary way on any machine in the shop. The large rectangular head also was an obstacle in the way of turning.

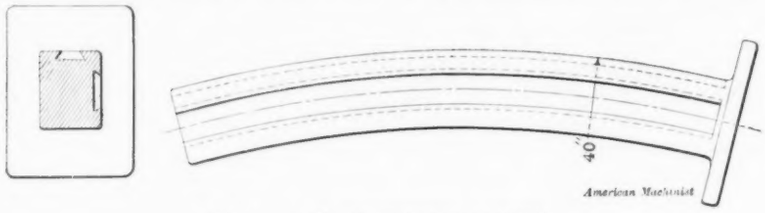


FIG. 1. A JOB OF CIRCULAR PLANING.

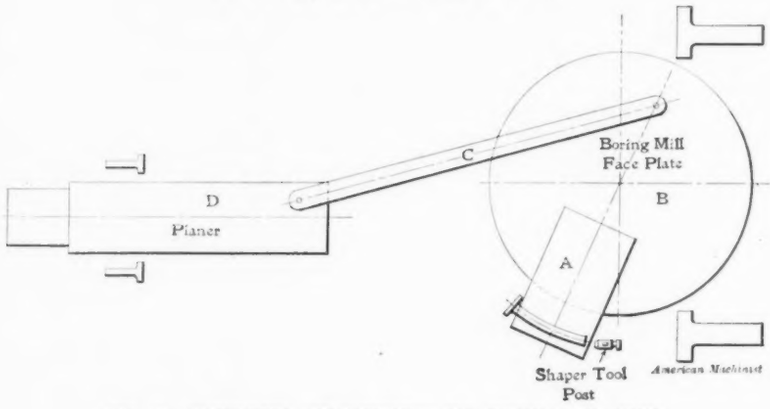


FIG. 2. IMPROVISED ARRANGEMENT FOR CIRCULAR PLANING.

Fig. 2 shows the rig for doing the job. The segment, having an outside radius of 40 inches, was clamped to an overhanging plate *A*, which was bolted to the table *B* of a 60-inch Bullard boring mill. The mill table was connected by a strap-iron link *C* to the platen *D* of a nearby Gray planer, so that the reciprocating motion of the planer platen was converted into an oscillating motion of the boring mill table.

The planer, being Sellers' geared, was set to give the segment the exact amount of movement required for the cut. A glance at Fig. 1 shows that all cuts stopped at or near the square head of the segment. The planer behaved beautifully, stopping and reversing the segment accurately as the tool reached the square head. A Pratt & Whitney shaper head, blocked out on an angle-iron from the boring mill head to the required radius completed the job.

F. J. P.

For Cutting Off Wire Pins.

Editor American Machinist:

The accompanying drawing shows a device for cutting wire pins. It is used in a lathe and is quite simple and easily made.

A is a plain arbor, turned taper to fit the latter spindle, and the other end to fit the bushing in the support *B*, which is held in the tool-post. This also contains the bushings for the wire to be fed through to be cut off into pins. The arbor also runs on the tail spindle center. It is necessary to offset the support *B* to let the wire clear the tailstock on some makes of lathes. The arbor *A* is turned down and threaded to receive the cutter *C*, which is screwed up to a shoulder and then pinned, the remainder of the arbor being threaded for the disk or gage *D*, which gives the length for the pins to be cut and is held in place by the jam-nut. With this device you can cut off pins nearly as fast as you care to run the lathe.

M. W. LEECH.

Making Some Special Taper Screws

Editor American Machinist:

I send you herewith drawings [here reproduced one-quarter size] of a milling fixture which I have lately designed for cutting the threads on a lot of taper screws, together with a sample [Fig. 1] of the work as it came from the machine. The screws required to be filed to a sharp point, and this was done by the boy who watched the machine, while the cutter was running through. Another boy took them in a speed lathe and removed the burr from the outer edges of the threads with a file.

The blanks were turned up in a screw machine, from 5/8-inch cold-rolled steel. The total length is about 2 7/8 inches. The threaded part is 1 3/4 inches long, and tapers to 3/8 inch in diameter at the point. The shank is 5/8 inch long and 27-64 inch in diameter. The pitch is 5 to the inch, and the groove about three times the width of the stock left standing. The time required to cut one screw was seven minutes, and for changing the blanks about three minutes. A special cutter was made, 2 1/4 inches in diameter, with 24 teeth. Two hundred screws were made, and at the end of the job it was in nearly as good condition as at the beginning.

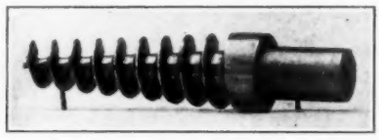
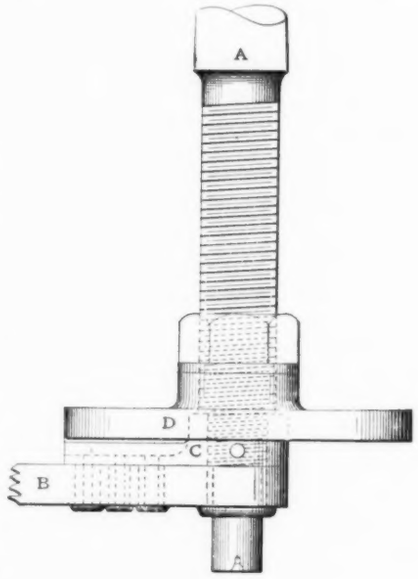
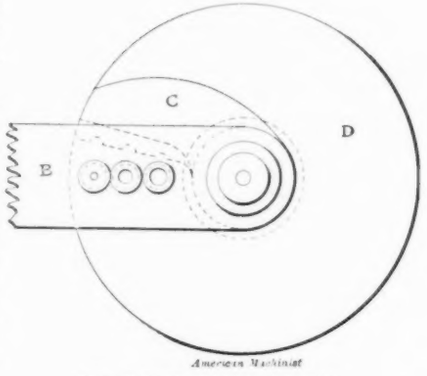


FIG. 1. A MILLED SCREW.

Referring to the drawings, Fig. 2 shows a plan of the fixture clamped to the miller slide at the angle required by the helix of the screws, about 11½ degrees. Fig. 3 is a side elevation of the fixture. In both views the relative positions of the cutter and the work are shown. The slide B is gibbed to the base *A*, and has a movement of 2 inches. It is actuated by the screw on shaft *C*, which has a pitch of 10 threads to 1 inch. Motion is communicated to this shaft from the miller feed rod *N*, through the pair of spur gears *F*. *S* is a screw blank partly cut, which is held by the draw-in chuck in the shaft *D* and supported by the rest *H*. Motion is communicated from shaft *G* through the bevel gears *E*. The ratio being 2 to 1, the blank





FOR CUTTING OFF WIRE PINS.

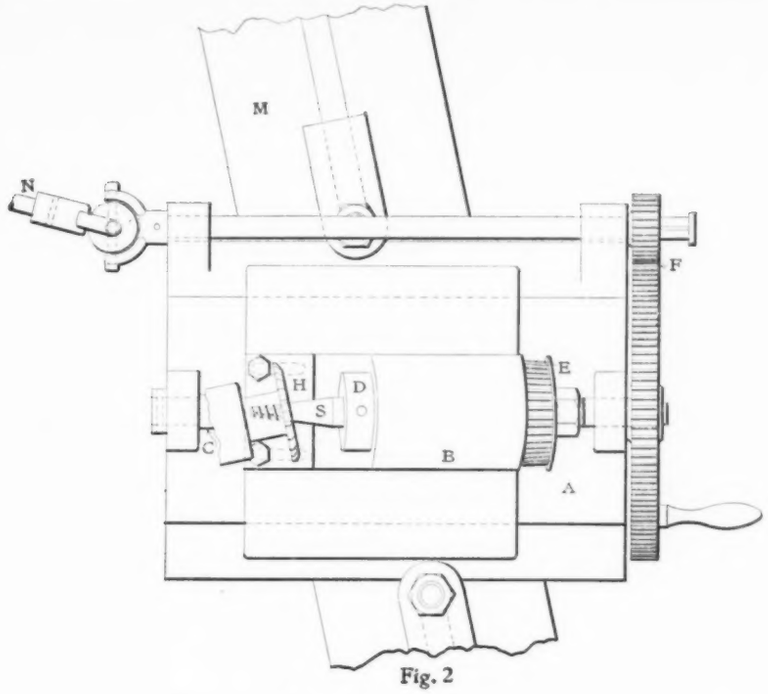


Fig. 2

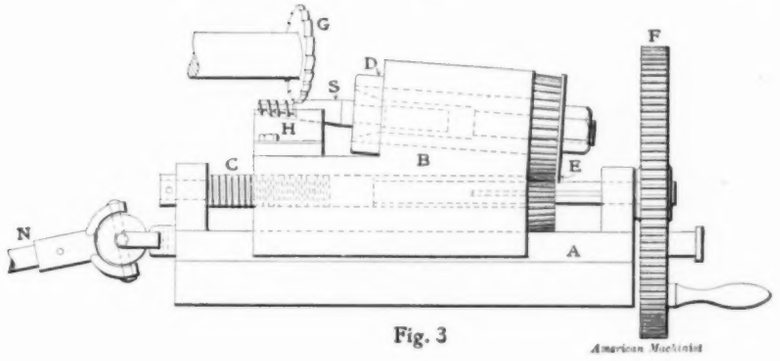


Fig. 3

FIXTURE FOR MILLING SPECIAL TAPER SCREWS.

gets five turns to 1 inch of forward movement, which gives the required pitch. It will be noted that shaft *D* is set on an angle, about 4¼ degrees, to bring the upper surface of the taper part of the blank horizontal. The smaller of the gears *E* is splined on shaft *C*, and as the slide moves, the flange on the larger gear carries it along. The smaller of the gears *F* is splined on the feed rod, so that it may be disengaged from the larger. When this is done shaft *C* may be rotated by using the handle attached to the large gear, and slide *B* run back to the starting point.

In operating the device, supposing the cutter to have been stopped at the completion of a screw, the nut on the end of the draw-in collet was loosened, the small gear *F* moved out of engagement, the slide run back by the handle as far as it would go, and the gear moved back into engagement. The table of the miller was then lowered until the stock was well clear of the cutter, when the screws in rest *H* were loosened and the rest slid back. The finished piece was then removed, another blank inserted, the collet drawn in, rest *H* slid up until it fitted the blank snugly, screws tightened, the table then raised to the proper hight, which was fixed by the usual vertical stop, and the miller started.

At the beginning the cutter stood just clear of the blank, so that it began work on the end, milling the full depth of the thread and finishing the work at one cut. We found by experience that when the slide had moved its full stroke and bore against the bracket at the rear, the feed belts slipped, and that no harm came if the machine was not stopped at once.

I would say that we first intended to use a hand feed, and so the fixture cost considerably more than was estimated; but, as we turned out the screws in about half the time we allowed for the work, the whole job balanced very well and showed a very satisfactory profit.

J. A. WEBSTER.

American and English Lathes.

Editor American Machinist:

On page 995 you have an article on "American and English Lathes in South America," by an "Exiled British Engineer." An individual who is employed on machine tools here must think what a suitable *nom de plume* he has laid claim to, and what a great number of years he must have been exiled by the way he talks of the machine-tool industry of Great Britain. It must give the impression to American readers what a slow lot we are over here, and how we are killing the trade by our actions to intending customers. As to the American tool being much handier on account of having an apron, for my part I do not see that there is any great difference. Of late some manufacturers here have adopted the apron, but previously all motions were governed in front of the carriage by different convenient methods, and not by spanners. If he had taken the trouble to inquire of John Lang & Sons, of Johnstone, one of the leading lathe makers of Britain, he would have been told that for the last twenty years all their lathes had been fitted with parallel bearings for the spindle in the headstock, unless specially ordered to the contrary. The absence of hollow spindles on nearly all English lathes is another mistake, for nearly all makers supply them if asked for. The above firm have made hollow spindle headstocks as long as they have manufactured lathes; also open hollow spindles which are very convenient for shipyard use. They are now making friction driven headstocks for all their different sizes of lathes, thus increasing the output of the lathe through being able to change from single to double gear without stopping the lathe.

It is time he learned the use of a gap bed and gave over misusing it. If you order a 20-inch swing lathe and it has a gap bed, allowing 40 inches to swing in the gap, surely common sense ought to tell him it is not advisable to do any machining above the 20 inches diameter, the gap being for swinging only, which makes it very handy for the boring of pulleys, wheels or such similar work. It is a pity that the writer is unable to have a look at some of the British exhibits at the Glasgow Exhibition this year, where he could add a deal of information to his present collection. I am sure readers of this paper, who have visited Alfred Herbert's exhibit in Glasgow, must own that their automatic and semi-automatic lathes are equal to any such lathes made in America, and they are not the only firm. My advice to the "exiled" one is to send the necessary dollars to the London office of the "American Machinist" for the annual subscription of the European Edition to let him know in his exile what some of the manufacturers are doing in the way of lathes, showing him numbers of firms who will let him have hollow spindles, cut gears, large journals, reversible countershafts, feeds controlled from the apron, and automatic stops. L. E. W.

Johnstone, Glasgow, Scotland.

"American and English Lathes in South America."

Editor American Machinist:

"An Exiled British Engineer" for various reasons prefers the American to the English lathe. Personally, I prefer both, or a tool which combines in varying degree, according to the work required from it, the characteristics of both. Any number of British tools may now be obtained in which the feeds are controlled from the apron, may be stopped by hand friction knob, and, if so desired, automatically also at any given point. *Re* open-sided washers for change wheel spindles, I have had them so made for years without demur by several makers, who now embody the idea in their regular productions. Touching the matter of alterations, various opinions are held as to the advisability or otherwise of humoring customers. (Chordal preached once or twice on this topic.) Conical or straight bearings will be furnished without comment by most British makers, and, if well made, are probably equally serviceable, and the conical neck well produced and properly handled will generally more than hold its own in the matter of retaining correct alinement of the spindle, though few makers here would recommend them for a heavier lathe than, say, 22-inch swing. In many cases probably it is wisest to adopt the parallel neck, as one never knows into whose hands a tool may fall. In a number of instances the hollow spindle may easily be dispensed with, as shops often have a run of work which does not call for it. On the other hand, the hollow spindle lathe should never be unrepresented, and if one lathe has to answer all purposes it ought to possess it, and also that "abomination," the gap bed. I have at present five lathes by different English makers, all with hollow spindles, which are used to a great extent on your correspondent's lines, one or two also having proper sud trays and geared pumps. The gap bed lathe is no doubt an abomination when badly made and expected to do what no reputable maker would claim, viz., do work to the best advantage on the full swing of the gap, but given a good gap bed lathe work of a very varied character can be done to sufficient advantage to justify its existence. Else why does a maker of such cosmopolitan experience of tool use and design as Mr. Geo. Richards deliberately design and build on mass production lines a 16-inch swing lathe in which the existence of the gap dominates the whole design. (This lathe is illustrated in the "American Machinist" at page 421, volume for 1895.) The design and performance of the head and tailstocks of at least a considerable number of makers here will now bear comparison with those of any other nationality. It is worth noting that the opposition of European users to the clumsy American footstock often in evidence a few years ago has had the effect of considerably improving footstock design both in America and Europe. Of course, the once common type of Yorkshire "merchant" tool was quite open to all the criticism of our exile, but the price itself would warn anyone as to the quality. All the same, I have often employed them to considerable advantage on certain jobs, qualified Americans who have seen them acknowledging they could not turn out the work produced any cheaper with a really good tool. However, this type of tool is being gradually outclassed by more expensive and efficient machines, and as well built tools may now be obtained from the former headquarters of "merchant" tools as anywhere else. It is natural that Manchester or Glasgow makers with a well-earned reputation should be able to command a good price for their productions, though most of them will probably lower their prices in such a timely manner as will enable them to retain their present volume of trade, and also gain such increase as they feel disposed to cater for. Even the most conservative of them have during the last few years yielded considerably to modern demands.

In his concluding remarks, our friend asks English makers to wake up, and, without charging absurd extras, furnish certain conveniences he mentions. There need be no anxiety about this, as practically every item he mentions is easily obtainable over here at reasonable prices, and I am open to furnish the addresses of makers who embody such in their lathes. So there is hope of an order or two coming from South America. Personally I should be the last to minimize the undoubted advantage to this country of the advent of American tools, and the prominence thereby given to the American point of view on many industrial topics. One may consistently admire good American productions and at the same time deny that English tools and methods are anything like as black as they are sometimes painted.

JAMES VOSE.

Manchester, England.

The Apprentice Problem.

Editor American Machinist:

I often wish I knew how other shop managers get along with apprentices. This class of would-be machinists has always been to me a great perplexity. In my experience I have found about one boy in ten naturally suited for the business. Perhaps it is too much to expect all our apprentices to be natural mechanics; and, indeed, it is a wonder to me that we find even one in ten, when we consider the methods too often used in selecting them.

There are always many more candidates than positions. It would seem that anyone at all familiar with the business should be able to select boys fairly well suited for the work. There are, however, many things that interfere with the shop manager's doing just what he thinks best. The office has some young men on its list who are judged to be just the boys for the business, and often one is ordered, or sometimes requested, to put them on. If it is an order, of course, the shop is subordinate to the office and the order is obeyed, while even if it is only a request boys are often put on who should instead be farmers or clerks, or anything, rather than machinists.

We have all over the country a large percentage of poor workmen. All-around, good machinists are becoming more and more scarce every year. To employ good, brainy boys as apprentices and then give them a thorough training is to my mind a very important matter, and one that, if neglected, will in the near future greatly affect the machine business. It is, of course, possible, owing to our improved tools, to do better work with poor workmen than it was years ago, but all the modern tools in the world cannot make up for the loss of good workmen. How many shops in this country select the best material for apprentices, and after starting them in make a special effort to train them in every branch of the trade?

I always find among applicants boys who have in some way had more or less experience with some kind of machinery, thus giving them at least an idea of the difference between a bushel of potatoes and a mowing machine, and who, when they see a lathe or a drill press, have some faint idea of what the machine is to do. Such boys, after a few weeks of helping around the shop, will catch on to the general idea of the work to be done. And if you watch them you will be able to form a very fair idea of their capabilities. With such boys it is well to make an agreement to try them as helpers for a month or so, giving them a chance at a drill press or on a lathe, and if they do not show up as being handy, bright and willing, let them go and try others. If they proved themselves capable, put them on a tool of some kind and carefully instruct them. There is always plenty of lathe work of a simple nature around a shop that is sufficiently in duplicate to teach a boy how to do a piece or two. Show him carefully how each operation is done, how to set the tools, etc., then let him try what he can do for a few hours. Go to him again, and, if he has made mistakes, point them out and show him how to avoid them. Do this pleasantly, get him interested, and if he is the boy you took him for, he will soon be capable of doing the piece in hand to your entire satisfaction. Step him along from plain to more difficult work; make a good lathe hand of him. If he is carefully instructed in two months you will have him earning three times the amount of wages you pay him.

Don't be selfish and insist that he shall stay on lathe work for a year or two. If his term of apprenticeship is three years, he should not be kept on the same

tool more than four or five months, or six months if his term is four years. Move him along, and as he goes forward you will find he requires much less instruction and is fast becoming a valuable hand.

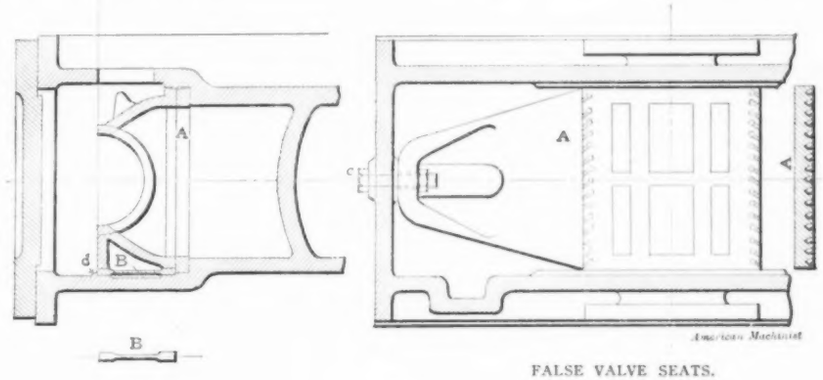
There are some difficulties in the way of having the boys get along as you would have them. One is the mistaken idea that it pays better to teach the boy one thing and keep him at it. Another, and a very great difficulty, is the lack of interest taken by the shop foreman, whose duty it is to instruct the boys. He is not always of the sweetest disposition, and is not inclined to waste time, as he puts it, on a lot of "kids." You would then naturally conclude that the foreman was not fit to hold such a position, but where can we get a better one? Of course, there are good foremen who fill their positions well, who are congenial, are not above their business, and who always (or almost always) give a pleasant answer to questions asked, either by those in authority or by the men and boys. I have met them and I have had such men in my employ; I am compelled to say, however, that such are the exception. It has been my experience that the position of shop foreman is the most difficult to fill of any around a manufacturing plant. It is not always smooth sailing for the apprentices or for anyone else. For the boy who can be pushed along as I have suggested is one in ten. The other nine are such that it is a very great strain on anyone's temper and patience to have anything to do with them. It is, therefore, all the more necessary to avoid the employment of this class of boys—in fact, to make a rule to drop any such as soon as they have proven themselves incapable. It would be money saved to do this, and much unpleasantness would be avoided.

It seems to me that the apprentice business should be entirely in the hands of the shop manager and that the practice of forcing him to take boys on as a favor to friends should not exist. When a boy is taken on he should have every opportunity given him, and he should be fairly treated in every way. Very many, in fact a majority, of the boys who are trying to master a trade are in such circumstances that the usual wages paid them are not sufficient to support them in comfort. There was a time when three dollars a week would enable a boy to, at least, live without help from any other source. But no one lives now as they did twenty-five years ago. In order to live under the present conditions in comfort and in such a way as to maintain self-respect requires more than simply board and clothing. It is, therefore, due them that they receive such wages as will enable them to do this. It is hardly to be expected that one who cannot have the necessaries, and at least a few of the comforts of life, will give strict attention to business and make of himself a good, reliable workman. B. W. T.

False Valve Seats.

Editor American Machinist:

I send enclosed a small blueprint showing the plates we use in our Rider engines, to avoid the wear produced by the moving of the slide valve against its seat, which if transmitted to the cylinder would cause very costly repairs.



FALSE VALVE SEATS.

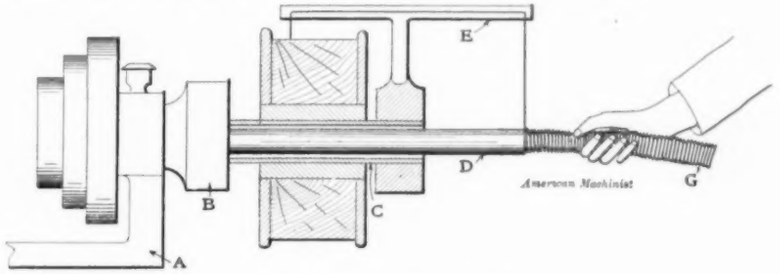
The two plates are of hard cast iron. The plate *A* is fixed to the cylinder by the bolt *C* only, to avoid its moving with the slide valve; the plate *B* is fastened only by stops *D*, cast with the cylinder. This disposition of the plates, added to an execution of great precision, allows us to make slide valve and plates in advance and to arrange all these pieces with a few hours' work. ARTHUR BOLLINCKX.

Brussels, Belgium.

Winding Long Springs.

Editor American Machinist:

I had to wind some tension springs, 40 feet long, of No. 16 wire, on a ¾-inch arbor, and the sketch is intended to tell the whole story. The shop and the job were both small, and a rough and ready way had to be devised. The length that might have been wound was of course only limited by the quantity of wire on the spool. *A* is the headstock of a speed lathe, and *B* is a chuck. *C* is a long brass pipe, held firmly in the chuck, and *D* is a ¾-inch brass rod loose in pipe *C* and held stationary by hand. *E* is a spool of No. 16 wire, fitting easily on pipe *C*, and *F* is a composition casting soldered to the outer end of pipe *C* and turning with it. The wire was led from the spool through a hole in the inner end of *E*, then along to the front, down through another hole in *E* to the arbor; as *E* went around it wound the wire on the arbor. *G* is the finished spring coming off. F. W. HARRIS.



WINDING LONG SPRINGS.

Request for Catalogs.

Editor American Machinist:

The article on page 1106 entitled "Replies to Requests for Catalogs, etc.," recalls an experience that lately came to our folks. Late last winter we received a letter written on a very poor quality of notepaper and the writing of which was evidently by someone whose living was not earned by the use of the pen. It contained a request for prices, time of delivery, etc., on certain machines which we make, and concluded with a request for a catalog. To look at the letter and its "environment" many would have said, "It's of no use to reply to *that*." We followed our usual custom, however; replied to his questions in detail, naming a date for delivery if ordered at once and sent a catalog. We did not really expect ever to hear from it, and after a few weeks we had ceased to think of it.

About six weeks after this letter was received we had another mailed from the same place and in the same handwriting, and on opening it our secretary nearly fell out of his chair. It contained an order for all the machinery quoted on, and enclosed

a check for half the amount of the order with a request for prices on additional machinery.

We replied to this that as so long a time had passed since our first quotation, and so many orders had meantime come in, it would be impossible to deliver the goods in less than sixty days, and that therefore we would hold the check till we heard from him, supposing he would cancel the order. We also gave him prices on the articles asked for in this second letter. In three or four days we had another letter from him, telling us to get it out as soon as we could, enclosing a check for the balance of the order, and ordering the machinery as per our second quotation. This is the only instance of the kind I ever knew of, but it goes to show that one cannot always judge from appearances.

A few years ago I noticed in the "American Machinist" a reference to a catalog issued by one of the very prominent firms of our country. I do not now recall the subject matter treated of, but I do remember that I thought it would give me information that I should prize, and as at the head of the column in which the notice appeared was the legend: "These catalogs sent to any address upon application" (or words to that effect), I sent in an application for a copy, enclosing two or three stamps. In reply I received a letter stating—in substance—that the book asked for was an expensive one, was not intended for gratuitous distribution, but for actual or prospective customers, and that it would be sent for a certain sum. I replied that I saw the notice as mentioned above, and did not care to remit the amount named by them and apologized for my blunder.

Now, I will not say that if I was called on to decide whether to buy this firm's tool or some other make, this incident would influence my decision adversely to them, but I know I never see their name in print or on a machine tool without thinking of that letter.

A BELIEVER IN COURTESY.

Punching Washers.

Editor American Machinist:

I send you a sketch of a punch and die for punching out washers, size ½x¼ inch. They are not punched out of stock cut into strips, but from a flat sheet, 12x12 inches. Fig. 1 is the punch and die. It is made in the regular way, with the addition of the square punch to shear off the waste and to straighten the edge of the stock for the next row. The punch is made ⅝ inch wide, and it is 9-32 inch from the center line of the die to the edge nearest the operator, which is just sufficient to clear the edge of the hole, and after the stock begins to pass the punch, the edge of the stock, marked *A*, Fig. 2, meets guide pin *B*, Fig. 1, and passes along until the end of the stock is reached; then another row is started, and so on till all the stock is used up. The stripper on the die is made so that the stock can pass underneath, and is ½ inch thick where the screws and dowel pins are, and 5-16 inch thick where the stock passes underneath, which leaves a space 3-16 inch wide for the stock and working of finger stop. C. ALIPER.

Another Blanking, Drawing and Punching Die.

Editor American Machinist:

On page 745 is given a description of a blanking, drawing and hole-cutting die, and I herewith send a sketch of another one, made somewhat differently. I see that the writer puts particular stress on his positive knockout method, but it is a method that I have used for several years. The sketch I send is for a die for making a small brass tip, of sheet brass, .011 inch thick. Fig. 1 is a section of the punch and die. *A* is the center die, and also the punch that forms the tip. *B* is the stripper which strips the work off punch *A*, and *C* is the die for the blank. *D* is a plate underneath, which, by means of the small pins, causes stripper *B* to do its work; it is held in its position by rubber springs (not shown) on the bolts or screws projecting below. *F* is the punch that punches the hole in the tip, the punching falling down through *E*, which is ground slightly larger for clearance. *G* is a knockout in the punch, which is made a nice working fit in punch *H*, and is itself bored out a nice working fit for punch *F*, and also has a slot cut in it to allow it to travel. Fig. 2 shows how punch *H* is held in the shank, and at *I* is shown the slot for holding punch *F*. Fig. 3 shows punch *F*, and *J* is the way *F* is made to fit in *I*. It also is a working fit in the knockout. In Fig. 4, *K* is the slot that punch *F* and *J* works in, and *F* is held in position by slot *I*, which screws up firmly against shank *M*. *L* is a

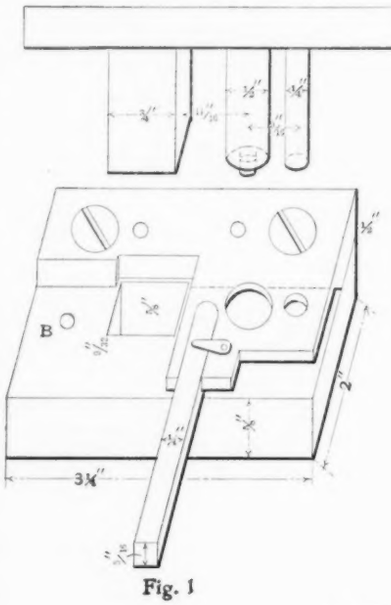


Fig. 1

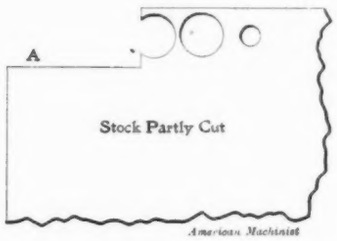


Fig. 2

PUNCHING WASHERS.

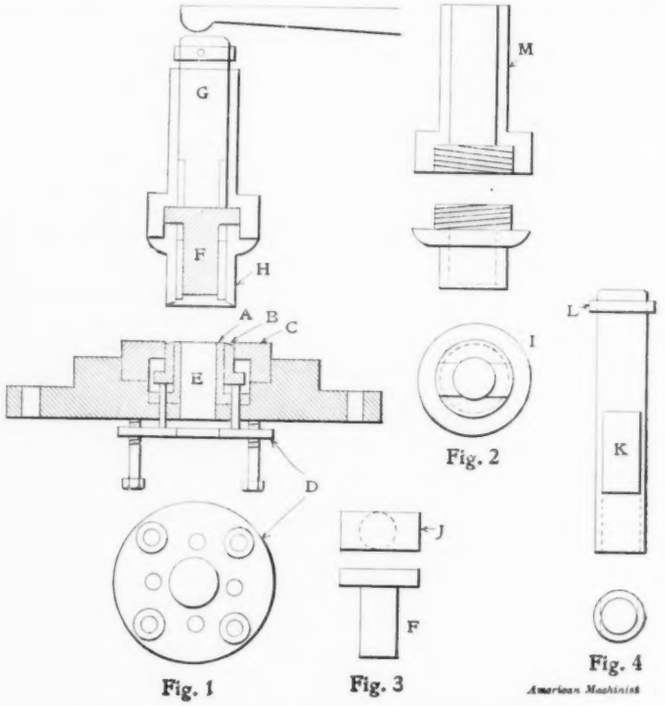


Fig. 1 Fig. 2 Fig. 3 Fig. 4

A SIMPLE BLANKING, DRAWING AND PUNCHING DIE.

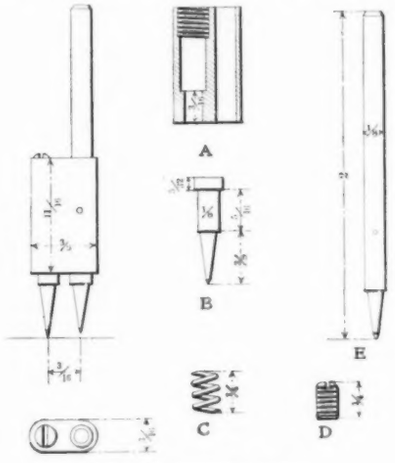
collar on knockout *G*, held on by a taper pin. The reason I made the bottom stripper to be worked by four screws with separate pieces of rubber on each screw was because the rubber was more effective and not so stiff as if in one solid piece.

C. ALIPER.

An Accurate Center Spacer.

Editor American Machinist:

On page 1109 is given a description of two new patented center punches, which, as pointed out by Mr. Morris Fulton, do not space off the centers a constant distance apart. In designing one myself I saw the disadvantage of those styles, and to get one to do the spacing correctly I



A LITTLE CENTER SPACER.

made it as shown in the sketch, which gives the tool complete at the left and then all the details full size. *A* is a section of the body of the tool, which is drilled to receive the center point *B* and punch *E*, and is counterbored for spring *C* and tapped for screw *D*. Spring *C* comes on the head of the center point *B* and the screw comes down on the spring to keep a tension on *B*. It will be noticed that the punch as it stands does not touch the line. This allows the center point *B* to be in a center mark already made, and, under the slight pressure required, the center punch is brought down to touch the line and is then struck by the hammer. If always held upright it cannot fail to space all alike.

C. ALIPER.

Another way to Make a Die.

Editor American Machinist:

On page 985 Mr. William Doran describes a die for closing metal around a mandrel or horn. While it would do the work, it could be done in a more simple way and with a die that would cost only about one quarter as much. As it is a good thing to know the various methods, I think it will be no harm for me to show a better way.

Before doing this I will point out what is defective, apart from its cost, in the die described by Mr. Doran. In the first place, where the two slides meet, when the punch is home, it is practically impossible to make a perfect joint along the forming edge, or to keep it perfect when done. The edges are sure to get rounded more or less, and to make a perfect joint on the edges of the metal to be formed the edges of the dies should pass over this joint alternately. This cannot be done in the way he describes. Then there is a decided tendency of the work to force the slides upwards, which never can be overcome, no matter how tight fitting the slides may be. The shape of the top of the horn is a half circle and the forming edges of the slides are quarter circles; this combination is almost as good as a wedge to force things apart, and unless the metal was as thin as tissue paper it could not be formed over the horn without some strain on the slides. Mr. Doran does not mention what gage of metal was used. Under such circumstances it is impossible to compress the metal along the edges of the seam, although it is absolutely necessary to make a tight joint, because there is always some springing back of the metal unless provided for.

Multiplying the moving parts of a die should be avoided if possible. It is not considered good practice to build a machine shop over a die when the same work can be done without any movement at all, except that of the press slide or ram. Sometimes such movements cannot be avoided; if, for instance, it is desirable to perform the equivalent of two or three operations at one stroke of the press. But the die referred to was to perform one

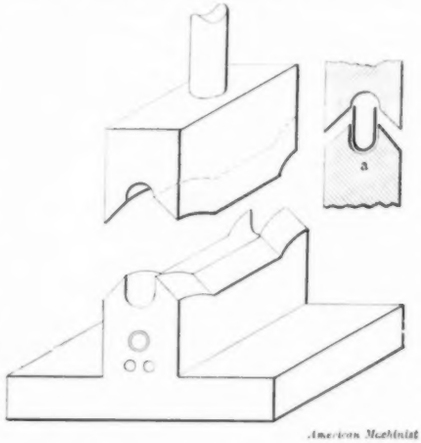


FIG. 1. THE TUBE CLOSING OPERATION.

operation only. The first operation shown by Mr. Doran to form the piece was correct, and is the standard way of doing such work; but the second operation should have been made on practically the same lines; the die and punch, Fig. 1, shows how. The shape of the article to be formed is especially favorable for this method, because the flat spots on the sides of the funnel-shaped ends give excellent opportunity to gage and support the metal while being formed, and also prevent it from turning around in the die.

By this method it will be seen that the number of pieces required to make the punch and die are reduced to practically two, in addition to the horn described by Mr. Doran. I cannot see why he did not attach one half of this horn permanently to the die at the back, so that the operator would only have to withdraw the other half, bringing the formed piece with it. This would reduce the operator's time one-half, making the die a much more rapid producer. Then, again, when inserting the horn and blank into the die, he gains time again in the same ratio. When it is considered that the diameter of the horn at the pointed part is only 3/8

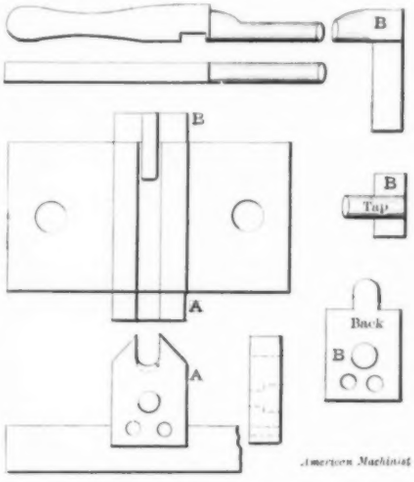


FIG. 2. THE DIVIDED HORN AND ITS GUIDES.

inch, and the strongest part of this is cut out of the center to make the mortises, this horn at the joint must be of most flimsy construction. It is intended to be separated and put together again five or six thousand times a day by unskilled labor. How long will it be a good fitting joint? This die seems to be a particularly dangerous one for the operator to pass one of his hands over or around, as he necessarily must do after the first few days, when the horn has become loose at the joint, to keep it from falling apart. There could be no rapid production with this die. I find on counting up the number of pieces required to make this automatic sliding die that they amount to fifteen, without the punch-holder, die-block and horn. Add to these twelve screws, and the sum total amounts to an even thirty; and all this for a simple operation that can be done, a superior job, with a punch and die made practically of two pieces, if we except the horn, and with one gage, because the part of the horn secured to the back of the die acts also as an end gage. The die itself, made this way, is a sufficient side gage.

It was unnecessary for Mr. Doran to make a mortise joint in his horn. A plain butt joint would have acted equally well, because the metal to be formed would have kept it in its right place. At *a*, Fig. 1, it will be observed that the seam that has to

be closed on the piece to be formed will come right along the center of the punch and must conform to its shape; that it is entirely enclosed by the punch and die, and that the metal cannot get away anywhere but the right way, and can be compressed there sufficiently to overcome any tendency to spring open when released from the die. *A*, Fig. 2, is the front gage to support the loose part of the horn, and *B* is the short part of the horn secured to the die. *C* is part of the horn detached from the die.

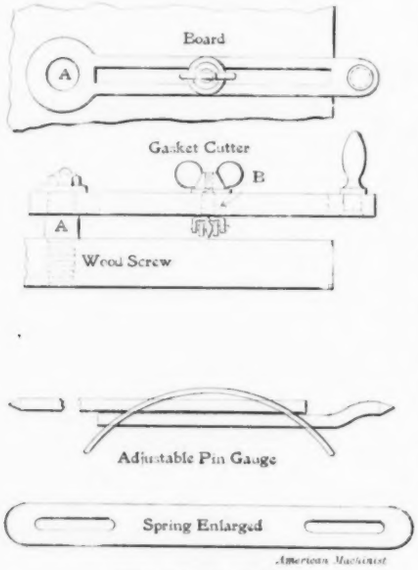
The mandrel or horn, as shown by Mr. Doran, looks all right in a picture; but is it? No doubt the casual reader would think that when it was pulled apart the formed piece would fall off from between the two pieces of the separated horn; but it would not. It would always stick on one of them, thus making necessary another motion to remove it. Besides this, it is unhandy to hold, and there is too much fumbling to put it together again, and it might be as readily put together the wrong side up as the right. With one end fastened to the die, as I show here, and the other held all the time in the right hand, the left hand is free to pull the blank off, put another blank in the die, and so on. These may be little things to speak about; but it is just these little things that make a die a success or a failure.

B. J. DOUGHERTY.

Cutting Rubber Gaskets — Handy Wire Gages for Inside Measuring.

Editor American Machinist:

I send you a couple of sketches of kinks, which I think will interest your readers. The first is a rig for cutting our round



TWO HANDY TOOLS.

rubber gaskets. In the shop where I got this rig up, employing 300 machinists, each man used to cut out the gaskets as he needed them; you can imagine the time and material lost. With this rig the foreman put a boy on it, cutting out all the sizes generally used, and these gaskets were then kept in the storeroom, to be given out on order only. With the old method, about six times out of ten the man would forget to charge the gasket to the job it was used for. The base of this rig is an ordinary piece of pine board with stud *A* screwed in. The forked stud *B* is square where it passes through the arm. It carries a small roller on each side of the roller cutter to keep the rubber from moving as the cutter travels along.

The other sketch shows a pin gage, which needs little explanation. A piece of hack-saw blade is annealed, slots are cut out and it is then spring tempered. The rods are of Stubs wire. One of the rods is offset, as shown, to bring its point in line with the other, and each point is tempered. When I first saw it I did not think the spring would hold the rods very firmly, and I was surprised when I tried to force the rods endwise.

On page 870 Mr. A. Mertes advises the use of a fine-pointed tool for resetting work already turned. I have seen that method used, and find that nine times out of ten you will cover a finished surface with cuts. In the shop where I work we all use the surface gage for resetting finished work. There is no danger of cutting the work with the gage, as there is with the tool. By holding a finger on the gage you can feel when the high side strikes the needle point and adjust the work accordingly. If you want to know how much the piece runs out, turn the chuck around by hand and watch the space between the needle point and the work. I have found this the quickest way yet to reset work; in fact we never use a mandrel where we can set the work in the chuck with a surface gage. My work is all large, such as steam chest covers, cylinder heads and such.

LATHE, PLANER & CO.

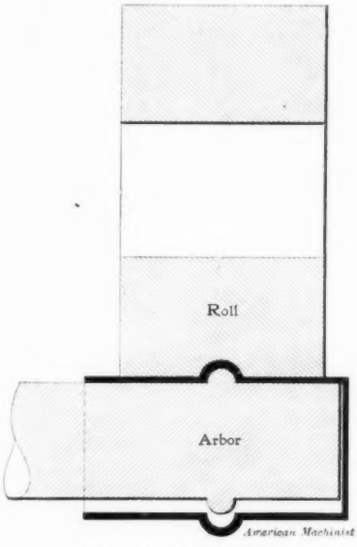
Expansion Punches and Beading.

Editor American Machinist:

Considered as a nice job of tool making, the expansion punch shown by Mr. Woodworth, on page 992, is all right, but as a practical, every-day tool it appears to have some weak points. Of course the cost of construction and repair of such a tool is necessarily great, and I shudder to think of the consequences should a careless press hand get a shell in the die in any but the correct position. The shape of bead which can be produced by this punch, or in fact by any process which does not confine the outside of the shell, is limited, it being impossible to produce a bead with a sharp corner at the junction of the bead with the side of the shell. Perhaps the most serious objection, however, lies in the fact that it does not produce a perfect job, for no matter into how many sections the punch is divided it cannot turn out a perfectly round piece of work.

There are several methods of beading shells in common use in addition to those mentioned by Mr. Woodworth, one of these being by the use of water in the shell which is confined in a die and is forced out to the shape of the die by a close-fitting punch descending on the water, the die being made in sections to admit of the removal of the shell. A machine for forming silverware by a similar process was mentioned in the "American Machinist" recently as in use by the Gorham Manufacturing Company. I have also seen shells expanded by the use of a piece of soft rubber, which was simply dropped into the shell and struck by the punch, the rubber returning to its original size and shape, and so on indefinitely.

Probably the simplest and cheapest way



BEADING BY ROLLING.

of beading shells in general use is by means of tools similar to those shown in sketch, which consist of an arbor with a bead and a roll with a corresponding groove between which the shell is rolled. By knurling the bead and groove, the shell may be knurled and beaded in one operation. It is of course necessary that the diameter of the bead on the arbor should be small enough to permit of the easy removal of the shell after beading. These tools may be used in a special machine (several kinds of which are on the market, and which are also arranged for rolling threads on shells of all kinds) in which case the work can be done by a girl. They may also be used in a lathe when the services of a boy or man are required. When the nature of the work requires the shell to be supported on the outer end, or when there is a tendency for the work to run off the arbor, a trimming and edging lathe is usually used. For the benefit of those not familiar with this type of lathe, I will state that both head and tail spindles turn and the tail spindle also has a reciprocating motion imparted by a treadle. The tail center is usually made of hardwood of suitable shape, and is

brought up to the work by the treadle, leaving both hands of the operator free to handle the work and the cross-slide carrying the roll or tool, as the case may be. The machine previously mentioned is also built to work automatically, the work being fed by hand into a chute, from which it is taken by the tools. NEEDLE.

A Fillet Cutter and Wood-Worker.

Editor American Machinist:

A machine for the purpose of making wood fillets for patterns is almost a necessity in every modern pattern shop. The expense incurred in buying prepared fillets or the labor wasted in shaping up a fillet after being glued in place as a square or a triangle is well worth the saving, if it is possible to do so. The demand for a cheap fillet is universal, but it is in no

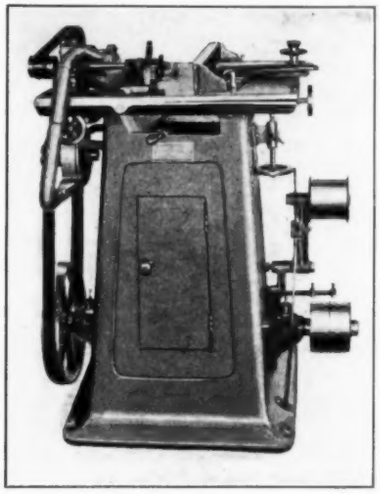


FIG. 1. FILLET MACHINE ARRANGED FOR MAKING FILLETS.

place so strongly felt as in a shop where 95 per cent. of the men are amateurs, and where a large percentage of the patterns made are never put to actual use because of duplications. Such conditions as these obtain especially in a university shop, for example, where from 200 to 300 men every year will take the course in patternmaking.

The demand for a cheap fillet in our patternmaking department brought forth the above machine, designed by the writer and built in the Purdue University shops, it having been in use now for several years and giving the best of satisfaction. The machine was designed, as stated, for making pattern fillets, but, by some slight modifications, it has since been adapted to tonguing, grooving, rabbeting, beading and the like, which makes it a very handy tool in our wood-working department. The machine has two mandrels, a cutter and a saw mandrel. The former, which shapes the fillet, has both a vertical and a horizontal adjustment to allow for cutters of varying shapes and sizes, the latter severing the fillet from the board after it has been produced. Just in front of the cutter is an adjustable chip breaker which also serves to hold the wood firmly to the table, the action being very similar to that of the pressure-bar in the Woodworth planer. The machine is provided with an adjustable fence and the regulation blower. Provision is made for the proper tension of the belts by the use of tighteners.

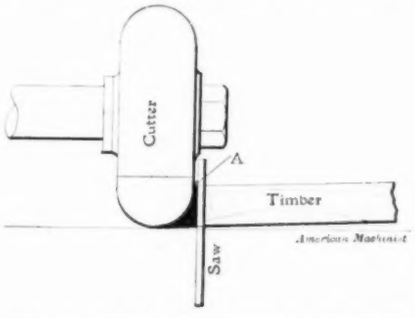


FIG. 2. SKETCH OF THE FILLET-MAKING OPERATION.

Fig. 1 shows the machine in adjustment for making fillets. In the production of the fillet the board is first sized in a planer to a thickness equal to the hight of the required fillet, the cutter is brought in line with the saw to give a feather edge on the fillet, as shown at *A*, Fig. 2, and lowered until it just misses the surface of the table; the table-leaf is tilted a little to give a slight obtuse angle to the fillet, after which adjustments each passage of the board through the machine produces a finished fillet the length of the board. The advantage of a slight obtuse angle on the fillet is that it brings the edges up more firmly against the sides of the pattern when glued in place. A machine fillet is much to be preferred to a hand-carved fillet, since the edges of the former are very regular and smooth as compared to the latter. The only finishing necessary before shellacking, after being glued in place, is to be freely sandpapered. A nest of different sized cutters is provided for making different sized fillets, each cutting edge representing a quarter of a circumference. The cost of an arm-load of fillets produced in this way is represented by a few cents' worth of lumber and a half hour's labor.

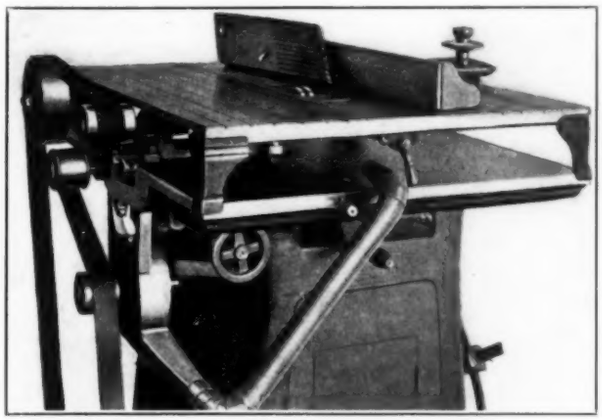


FIG. 3. FILLET MACHINE ARRANGED FOR TONGUING AND GROOVING.

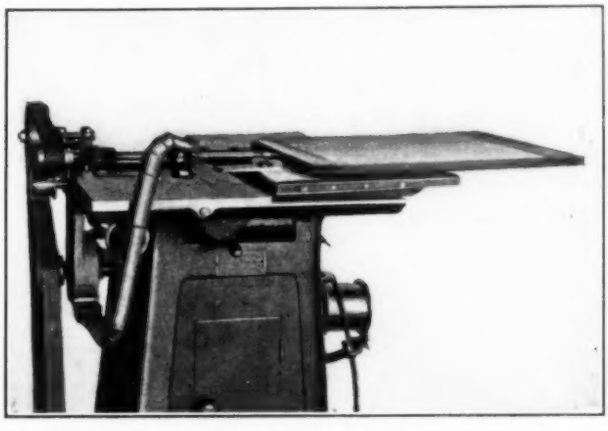


FIG. 4. FILLET MACHINE USED FOR BORING.

For tonguing and grooving, Fig. 3, the machine is provided with a light, portable table, having an adjustable throat for the cutters and springs to keep the board snug against the fence. The material is put through, as is done on an ordinary hand-jointing machine. The matching cutters may be replaced with any other shape desired.

Fig. 4 shows the machine set for light boring. After the bit has been adjusted, the timber is moved to and from the bit by hand, a set of stops serving as guides for the timber. The cut shows one of our yearly products, the "drawing board."

Purdue University. J. D. HOFFMAN.

Drilling Glass.

Editor American Machinist:

Several replies to the request for a method for drilling glass, which appeared in No. 31, have already been published in these columns, but it seems as if the details attending the operation have not been explained clearly enough to enable a novice to drill glass rapidly and successfully.

In the first place the tube method is preferable to the use of common flat drill, less material being removed. Copper tubing is preferable to brass, it being softer and therefore holding the abrasive better, and the thickness of the wall of the tube, even in large sizes, should not exceed 1-32 inch.

Carborundum, grade 80, is the most suitable abrasive and should be mixed with light machine oil so that the mixture will flow slowly. The proper degree of fluidity is a matter of great importance.

The glass to be drilled should be supported by a felt or rubber cushion not much larger than the hole to be drilled, and the abrasive should be placed on the glass and moved under the drill with a thin piece of soft wood in order to avoid scratching.

The copper tube drill, which may be soldered to a brass shank, ought to have a peripheral speed of about 100 feet per minute. Less than this wastes time, while a greater speed throws off the abrasive by centrifugal action. The drill should be brought into contact with the glass about 200 times per minute with a comparatively light pressure.

If the glass can be reversed, it is preferable to drill about halfway through, wipe off with waste carefully, turn the glass over and drill to meet the first cut. The moment of breaking through the glass is the critical time. The fin left in the hole can best be removed by a round second-cut file, wet with turpentine.

These observations are the result of drilling many thousand holes from ¼ inch to 1 inch in diameter in glass varying from single thick window to ½-inch plate. FREDK. W. TURNER.

The Milling Machine as a Cam Cutter.

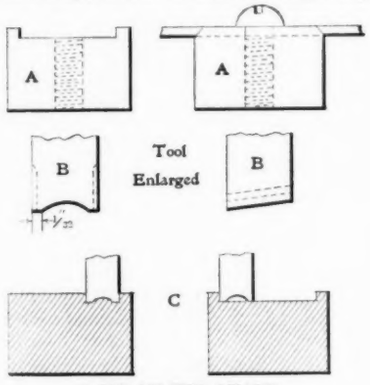
Editor American Machinist:

It fell to my lot to cut a grooved cam; a templet or former for which was furnished. It was expected that some special rigging would be required to do the job and the plan adopted reduced this item to a minimum. A glance at the job suggested the need of a stationary stud carrying a roll against which to have the former bear while rotating and thus reproduce its form on the cam. Observation showed that the spindle and back gear shaft of the universal milling machine were practically in line horizontally and this determined the method to pursue. The back gear shaft and appurtenances were removed and a piece of shafting of the required size, reduced at one end to carry a roll, was put in its place. After measuring the distance between the center of the spindle and center of back gear shaft, the former and cam were placed on a mandrel the proper distance apart to allow the cutter to clean up both sides of the groove cast in the casting for the cam. An old machine column to which was fastened a shaft carrying a loose wheel, a rope and a weight, affording means to keep the former against the roll, completed the rigging and work was commenced. By turning the mandrel by means of the worm in the dividing head a very satisfactory job both as to time and quality was produced. W. R. G.

A Job on the Shaper—The Marks on Twist Drills.

Editor American Machinist:

Having had occasion to shape slots or grooves in a large number of brass pieces of the shape shown at *A*, and being obliged



A JOB ON THE SHAPER.

to get the bottom of the groove perfectly straight to insure good electrical contact, I simply took a piece of ¼ inch square self-hardening steel and ground it to the shape shown at *B*, the same being used in an Armstrong tool-holder. After grinding the end of the tool as straight as possible on the side of the emery wheel I ground away the center portion, as shown, on the corner of the wheel. After setting the tool properly I put a boy at it, and by clamping pieces on the cross-rail slide on both sides of the shaper table, to limit the side movement, and giving him a mark to go by for depth, he would first place on a parallel as many pieces as the shaper vise would easily open to, and put strips of emery cloth on each side, the better to hold them from slipping. He would bring the table against one stop, feed down to the proper depth and then feed over to the other stop by hand. In this way we got a very good straight surface. For the next lot he would simply raise the tool enough to clear the work and, after going down the proper depth, feed in the opposite direction. *C* shows the principle. This manner of grinding the tool leaves a much truer surface (as is obvious).

To prevent the numbers on the straight shanks of drills from being obliterated by the drills slipping in the chucks, I simply file a small flat spot on which I stamp the number. This does not injure the drill and protects the number effectively.

ROBT. LACHMANN.

A Dog Catcher.

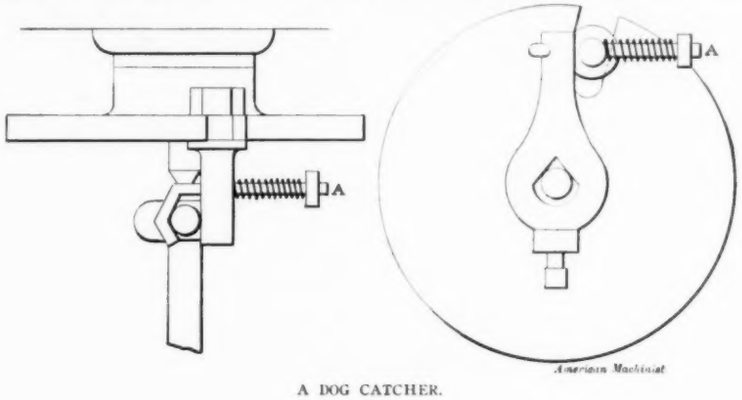
Editor American Machinist:

A piece of bent wire threaded at one end, with a nut and a small spring, as shown at *A*, make a happy combination and a handy article for a lathe hand. It might well be called a dog-catcher, its business being to hold the dog by the tail, and is used in connection with a straight-tailed dog and a driving stud. For work that is unbalanced, slotted, or otherwise of broken surface, as sectors, crank arms, etc., and in cutting threads it is especially useful. The accompanying sketch shows its application; 3-16 inch wire is heavy enough for most work on 16 or 18-inch lathes, and the hole in the stud should be about ¼ inch. If the bent end does not adjust to some carriers, a slight tap with a hammer will bend it to suit. E. J. BOWERS.

Beeswax as a Lubricant for Cutting Brass.

Editor American Machinist:

I noticed a kink last week which I had never seen before. It was to use beeswax



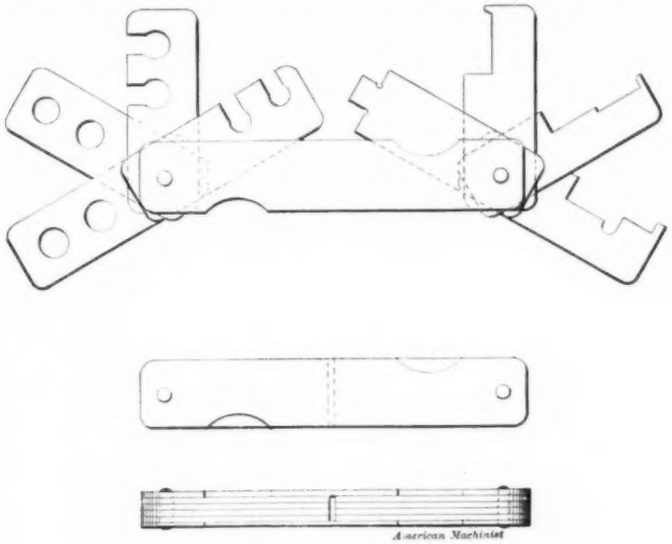
A DOG CATCHER.

as a lubricant for brass in cutting it. Some slots were being cut in brass and the usual heavy burr was thrown up. Someone spoke of using beeswax (holding a piece on the cutter), when the same cutter, without grinding, cut the nicest slot you ever saw, without a sign of a burr. I afterwards tried some on a drill, and it did away with the customary squeak. I suppose it would do as well in tapping brass, but did not try it. F. H. B.

Handy Gages.

Editor American Machinist:

It is often desirable, where there are quite a number of operations on a piece of work and a number of gages to be used, to have them all together as near as possible, for convenience, as well as to avoid being lost or misplaced, which is often the case where they are lying around loosely. The sketch will illustrate a very simple way of keeping them together. As will be seen, it is the same as an ordinary thread gage. The whole thing is made of 1-16 inch B. & S. bright stock, case-hardened. Thicker stock can be used if desired. It is only in some cases, not all, where a gage of this kind would be of any use; but where it can be it is neat and handy.



A HANDY GAGE.

M. W. LEECH.

A Gage with Renewable Jaws.

Editor American Machinist:

The snap gage shown in the sketch has given satisfaction in use, and is easily repaired when worn below size. There are from one to four sizes on the gage, according to the piece of work. The gages are made in pairs, one for the inspector and one for the workman. Standard blocks the size of the openings are kept by the inspector of gages for use in testing or in repairing the gages. *A* is the handle and *C* the gage opening. The block *B* is held in place by the screw *D*. When the gage becomes worn, place a piece of thin sheet metal back of the block *B* and regrind if necessary.

I know three ways for doing a good job of grinding. Place centers on the gage at *E* and grind in the universal grinder on centers, letting the gage remain stationary and feeding the wheel into the openings. In some shops they have a fixture to go on the grinder centers. It consists of an arbor cut away so that the gages can be clamped to it. The usual way of grinding here is to fasten the gage to the slide rest of the bench lathe and grind with an emery wheel or lap placed on the lathe centers.

For small openings it is necessary to use a copper wheel called a lap and charged with emery, carborundum or diamond-dust. The sides of the lap should be concave to prevent rubbing.

C. H. WILCOX.

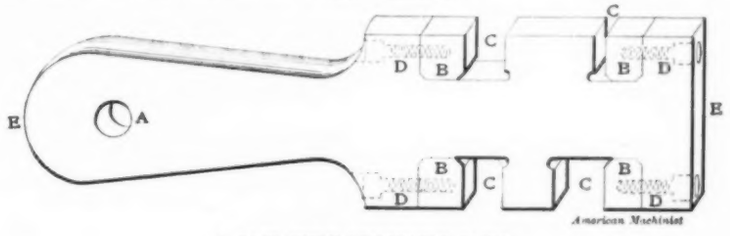
The Successful Foreman and Others.

Editor American Machinist:

The successful foreman is one who has both the confidence of his employer and the respect of his workmen. He must be able to produce work at a low cost, to maintain order and system in the shop, reduce the waste to the lowest point and keep things generally moving. He must be clear-headed and keep his wits about him at all times. His hours outside the shop must be regular, as late hours do not conduce to a good mental condition the next day. Details must be carefully watched by him to avoid mistakes. He must realize that the best way to correct mistakes is not to make them. Before a workman has completed a job he knows what he is to give him next. He studies the distribution of the work, and doesn't give a light, accurate job to a man used to heavy work, or *vice versa*. He requires the men to work all the time for which they are paid, and likewise sees that they are paid for all the time they work. He is pleasant and agreeable to them, but never gets familiar. He has a way about him that makes his men feel that he is in charge, but that he respects them and expects respect in turn.

He must be able to answer questions pertaining to any job in progress and to answer them correctly and promptly. He is able to tell how to do any job he has on hand, or even to take the tools and do it. He must find newer and better ways to do old jobs, as well as new ways to do new jobs. When anything goes wrong, he insists on knowing why and how it happened that he may prevent a recurrence of it. He looks closely after the conditions of the machines, and makes repairs as soon as needed. He has all tools kept in their places and sharp, as he knows that good tools in good order are essential to rapid and accurate working. His idea of the time it will take to do a job must correspond closely to the time it afterward takes to do it, else he is likely to hear from the office. If his estimate is too high, the job often goes elsewhere, and if too low there is a deficiency to be met, which is even worse.

He often gives an observer the impression that he hasn't anything to do but look on at the others working; yet the fact is that he is about the hardest worker of them all. He knows just about what every man is doing and how long he ought to be about it. His wits are about him every minute in the day. He may answer a question and the next minute he may need an answer to something entirely different. His stock of patience must be inexhaustible or he will be known as a crank; but then many cranks successfully operate many parts of many different kinds of machinery.



A GAGE WITH REMOVABLE JAWS.

Now, there is another kind of foreman. Enter the shop presided over by one of these. You climb over castings and other things, or push your way around them and you find the foreman about as untidy as the shop. An apprentice and a journeyman may come for a job at the same

time; the apprentice is attended to and shown how to do his job, the journeyman waits until a casting is dug out of the pile. He is told to bore it to fit another piece given him. He goes and chucks it and comes back to find out whether it is to be a tight or a working fit. He removes it from the chuck after boring it, and then finds that it should have been faced on one side. A hunt for a mandrel follows, around the machines, under the benches, etc., and most likely he doesn't find one. The machines are dirty and greasy; he never finds time to clean them. He never makes a repair as long as the machine will run at all. Tools are of all shapes and sizes, and kept on the floor or under the benches. When a new tool is wanted it is never ordered until it is to be used. Of course the time the workman waits for it isn't worth anything.

There is a big pile of scrap and the piece wanted is sure to be at the bottom; so, rather than dig it out, another piece is cut from a bar. Errors are so frequent that they are considered part of the necessary work. The belts on the machines are so slack or so badly worn that they won't pull a heavy cut, but it is better to do eight hours' work in ten than to spend money for belts.

He believes in cheap labor that isn't cheap, only low-priced. His idea is to keep expenses down by not buying a thing when it can be avoided—even if the price of a tool could be saved on the single job that needed it. He is often a hard worker, but uses his hands more than his head. It is a common occurrence to have several men waiting for a job at the same time, and he lets them wait while he thinks what to give them and where to find it. He seldom gives explicit directions as to how he wants a job done, and then he howls if it is not done just as he thinks it ought to be.

Things go wrong every day, and the same troubles occur often. He doesn't seem able to avoid them, or to profit by previous experience. Being a foreman he doesn't have to use his hands, but the chances are he doesn't use his head either. He is looking for a snap, and he makes his berth as soft as possible until he is "fired." Foremen have many other traits that I can't here enumerate, but we have all run up against some of them.

J. L. GARD.

Ball Bearings on the Drill Table.

Editor American Machinist:

Very often I have to do considerable drilling on small dies for our toolmakers, and I have found it very difficult at times to get the work to come perfectly in line with the drill, especially when using very small twist drills. The drill not being strong enough to bring the work to the desired spot, it frequently happens that either the drill breaks or drills a hole which, to say the least of it, is not satisfactory. Now, this being a bicycle shop toolroom, ¼-inch balls are plentiful; so I took four and placed them on the table of the drill press and cut off four rings, ⅛ inch wide, from a piece of ¾-inch brass pipe and placed one around each ball to keep them from rolling off the table. I found that, by placing the die to be drilled upon these balls, no matter how fine a hole I wished to drill, the drill would always bring the work to the correct spot.

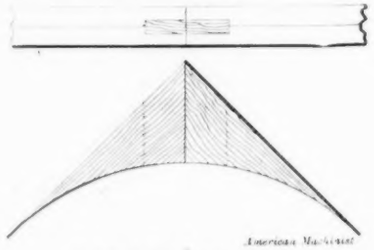
I think it was Mr. Tecumseh Swift who quite a while ago was advocating in your columns a more extended use of steel balls. I quite agree with him that there are many good uses that they may still be put to. I think the idea I have spoken of could be extended, and that a small fixture might be made for the toolroom drill press table, having two plates, say about 8 inches square, ¼ inch thick, recessed in four places, so that the balls could not roll out, to be kept for just such jobs as I have described. I am aware that most of your correspondents are good mechanics, but I hope this communication will be none the less welcome though submitted by just a common DRILL HAND.

[Suggestions and ideas are welcome from anybody whomsoever. Our correspondent is evidently able and disposed to think about his work, and such thinking usually leads men to better things than running drillers.—Ed.]

Thin Pattern Work.

Editor American Machinist:

I would like to suggest a little addition to Mr. Wm. Newton's method of attaching brackets, as shown on page 1118. If he



A THIN PATTERN JOINT.

will run each joint of the bracket over the circular saw and make a kerf ½ inch deep and glue a tongue in, with the grain running the short way, he will make a far superior joint. CHAS. REYNER.

Hypercriticism.

Editor American Machinist:

I have noticed what Mr. Morris Fulton has to say on pages 1109-1110 about a couple of recently issued patents for center punches. I can't help thinking how differently those inventions would have looked to Mr. Fulton, and how differently he might have discoursed about them, if he had honestly tried to find the good in them, instead of only the bad, and I thank myself that I am an optimist instead of a pessimist all the time.

On the face of it, the presumption is decidedly in favor of both of the inventions as being of some practical value. They look shoppy. We can imagine that some fellow has got up one of either of these for his own use, because he has wanted just such a tool, and that in use he has found it very satisfactory and perfectly filling his "long felt want"; and then some of his fellow workmen also may have appreciated his device and urged him to get a patent on it. Neither of those center punches, we may believe, was invented by a farmer or a lawyer, or by any of those fellows who can invent best in lines where they are the most ignorant, but by a machinist in the shop, who should be the man to invent tools for himself and for other machinists.

In the case of the little twin center punch, for marking a lot of center points in succession only an eighth of an inch apart or so, Mr. Fulton tries to argue that it would not in use give a constant spacing. He only tries to show that the first space would be slightly different from the rest, but he tacitly concedes, as everyone else must, that all the other spaces would be alike if other conditions were constant. The minute objection which he tries to sustain may be said to be entirely theoretical rather than practical, and in his handling of the case he gives us a good illustration of the abuse of the theoretical.

It should be remembered that the little tool is not intended to be used with a sledge, but is to be tapped only gently with the lightest hammer of the toolmaker's kit, and if larger centers are required they are made by going over the centers again with a single punch and a heavier hammer. Mr. Fulton conveniently ignores this, and produces an exaggerated sketch which he thinks shows that the punch will not work right under the impossible conditions there assumed, and his argument appears to be that because the punch will not work right where it ought not to work right it therefore will not work right where it ought to work right. There may be some invisible logical connection that makes it all right, and a lot of current reasoning about theory and practice calls for this same invisible connection.

There is a curious thing about Mr. Fulton's exaggerated sketch. He does not explain it in detail and we have to guess for ourselves whether, having made two centers of equal size and depth with the twin center punch, the distance between these two being of course perfectly correct, the distance to the third hole will be greater or less than this normal distance. The deep center already punched is at the left and one of the punch points is down in it, while the point of the other punch at the right rests up on the flat surface to be punched. Now, if the punch point that is down in the deep center is in the apex of that center, then, as the line from that punch point to the point that rests on the flat surface is on a consider-

able inclination, the distance to the third center will be somewhat shortened. But it happens, as plainly appears in the sketch, that the punch point is not down in the apex of the punched center, but is an appreciable distance above the center and *to the right of the axis of the center,* thus by its position compensating, partially if not entirely, for the shortening of the distance by the inclination of the instrument. Mr. Fulton might make another sketch and figure it out for us. It looks like one of those things that could be made to work either way.

Mr. Fulton alludes to another point that seems to be worth looking at a little. He says that if these two center punch inventions were actually good for anything what is the use of getting patents on them, for the fellows will go to work and make them for themselves, and he can't run around to the different shops all over the country and collect his royalties on them. All that is true enough but not pertinent. The patent is obtained to secure the right to manufacture and sell the article. The patentee may either engage in the manufacture himself or he may sell the right to some established maker of small tools who has facilities for making and marketing. The right of the maker will be easily enforced against any other extensive manufacturer, and that is all that is wanted. The protection against the makers of single specimens of the invention is automatic. A fellow can't afford the time to make small tools for himself now, and he can't begin to make them as accurately as they are made in the tool factories. Many of these small tools don't require even a patent for their protection. Who would think of making for himself even a center gage or a straight-edge, not to mention the more elaborate graduated tools of Brown & Sharpe or of Starrett? If the twin center punch is a good thing it is tolerably certain that one or other of our enterprising tool manufacturers will make a lot of them and put them on the market, so accurate and reliable and cheap that no one would have the personal momentum to drive him into and through the tedious operation of making a single one. When fellows do try to make such things as these for themselves they in these days serve rather as examples of folly and as advertisers by contrast of the excellent tools which they try to imitate. It is the modern way to earn and buy small tools rather than to make them, and those who do the latter, even if the article is patented, find that the evasion of the patent costs more than it comes to.

TECUMSEH SWIFT.

Most Things are New to Somebody, But Few Things are New to Everybody.

Editor American Machinist:

By way of preface I wish to remark that I have no intention of "sassing" the editor. I know better. Neither am I "sore," nor have I any "kick coming." I also fully endorse your recent editorial remarks to the effect that the editor must of necessity be the judge of what shall be admitted to the columns of the "American Machinist." With this preamble I wish to give utterance to an idea which has often occurred to me, which is, that our impressions as to what is familiar or otherwise to the world at large (mechanical or otherwise) are very apt to be formed, or at least strongly influenced, by what has come within the range of our own personal experience or observation. This, of course, is quite natural, but may at the same time be a very mistaken view. I am led to speak of this by the fact (which you probably do not remember) of a recent contribution of mine (relating to a ball-actuated ratchet) having been declined by you on the ground of its being too well known to be of any interest to those for whose benefit it was supposed to be published; this opinion being based on the fact that you had had some experience with it some years ago. I do not wish to dispute the correctness of your view of the case, but would say that there are in use in this city some thousands of presses (and it was as a roll feed for presses that I mentioned it) having feeds of all kinds, and in an experience of twenty-five years in the shops and in contact with men employed in them, I have never seen this feed used or heard of its being used, and the foreman of the room where it was first used looked upon it as something new, to him at least, and he is a man of extended experience, East, West and South.

Per contra, there appeared in a recent issue of the "American Machinist" an illustrated description of a set of foot-press tools for piercing German silver ferrules, which of course would not have appeared if the editor had not considered it to be sufficiently new and novel to be of interest to at least a fair percentage of his readers, and yet it is safe to say that such tools as those described, and similar ones, are so familiar to every man having any experience in sheet metal working tools that it would probably be a matter of mild surprise to them to find that everyone else was not equally as familiar; which goes to illustrate the point I am trying to make, viz.: that it all depends on the point of view.

I would not be understood, however, as speaking in a slighting manner of the tools in question or anything else contributed in good faith, and think the remarks of a recent correspondent, who took a man to task as behind the times because he happened to mention a device with which the aforementioned correspondent was familiar, cannot be too strongly deprecated.

There is probably nothing in the above which you will care to print, but having relieved my mind, I feel better.

NEEDLE.

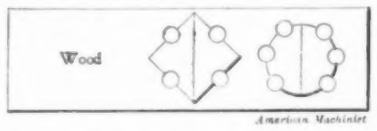
[Our correspondent, in the above letter, hits upon and vividly sets forth one of the principal difficulties with which the editor of such a journal as this has to contend. His letter led to a reversal of the first decision, not to publish his contribution referred to, but an interesting point in connection with it is that when it was handed to one of our accomplices to edit and prepare for the printer, he looked it over and returned it with the remark that the device was so well known that he thought it was hardly worth publishing, so that two editors came to the same conclusion regarding it. Yet it was published. Another phase of this difficulty is in the fact that where a reader of the paper sees something in it that he himself has long been familiar with, he is apt to conclude that everyone except the editor has known all about it all his life, and accordingly he condemns the editor as an ignoramus and the paper as a fake. The fact is that the decision as to whether a given contribution shall be accepted or not is nearly always a compromise between various considerations—among them a guess as to how many or what proportion of the paper's readers will find it valuable to them or interesting. It is scarcely ever expected that all readers will be interested in any given article. If nearly every reader finds one article, or one idea, in each issue that is of value to him, that is about as much as can usually be expected, though of course many of them find more. —Ed.]

Utilizing Scrap — Broken Twist Drills—Sawing Flat Disks of Steel.

Editor American Machinist:

It pays to take care of scrap pieces of tool steel, machinery steel and cast iron and to have them distributed in racks according to shape and size to be easily found when wanted. The value of the material amounts to very little, but to find a piece cut to the right length and size and partly finished means often from five minutes' to an hour's time saved.

Broken twist drills are about as useless articles as anything, but I have taken care



SAWING STEEL DISKS.

of some and sometimes have found them worth a great deal. Very often we toolmakers have to counterbore for filister screw-heads, and sometimes we don't happen to have the right counterbore for it. I then take a regular twist drill the size of the screw-head and run down almost as deep as the head is high. One of my broken drills of the same size is then ground flat at the cutting end, with clearance on each lip, so that it will cut and leave a square shoulder in the hole.

This works very nicely, as the central part of the drill has no cutting to do.

I have had pieces of iron and steel to saw in two sometimes that puzzled me, but some years ago I learned a way of doing it that saves time and works well. The pieces I speak of were round disks from 1 to 3 inches diameter and from ⅛ to 1 inch thick, and square pieces of the same thickness and width to be cut in two diagonally, and things like that. I preferred to do it on the hacksaw so as to spend no time with it, but the jaws on the common machine hacksaws will not hold a flat piece 3 inches square by ½ inch thick, while the saw cuts from corner to corner, and setting the piece on edge the saw would run out too much, so now I lay it on a piece of wood, say, 4 inches wide by 8 inches or so long and an inch thick, and drive some nails around it to hold it down (see the sketch) and clamp the wood in the jaws, placing it so that the saw-blade will cut over the corners as marked. This works very nicely. Try it.

J. J. HAGELGREN.

A Turret Lathe Job.

Editor American Machinist:

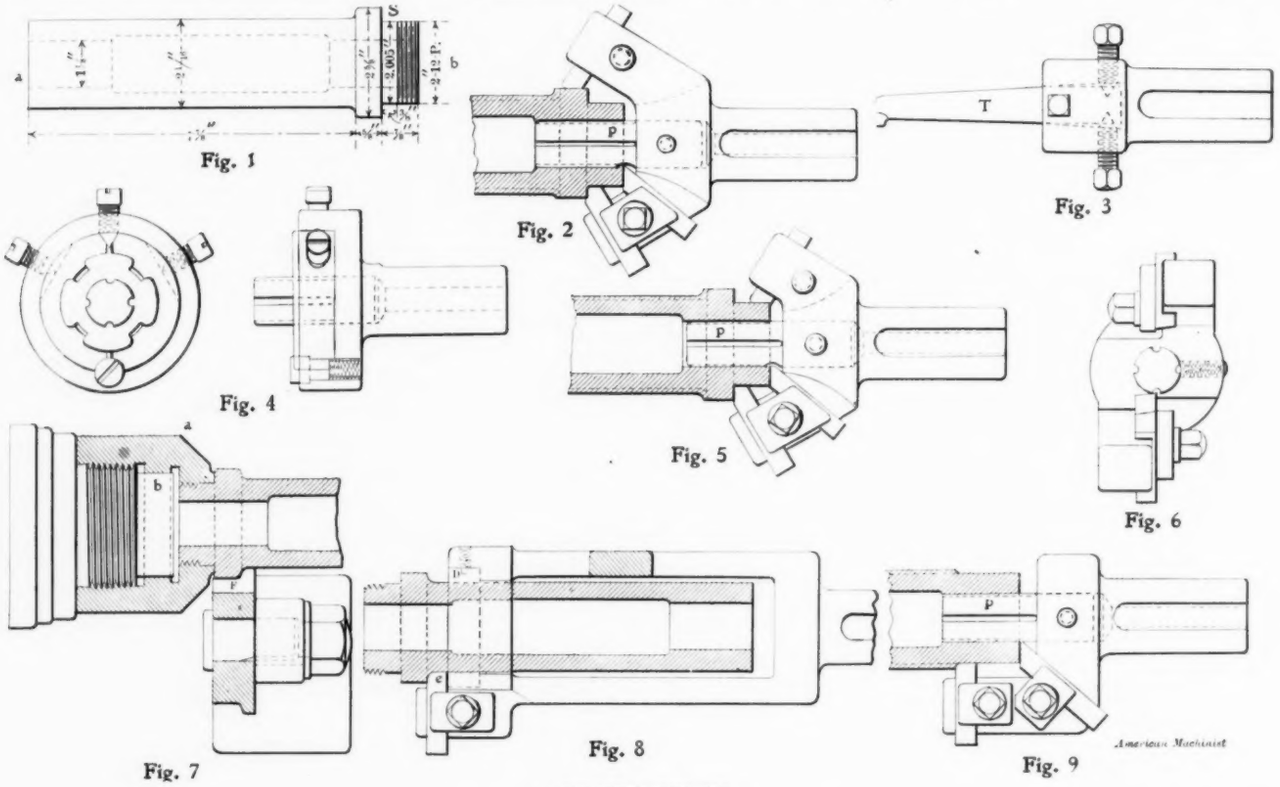
I send you sketches illustrating an ordinary lathe job, also the tools and operations necessary to produce this piece on the turret lathe. Fig. 1 shows the piece to be made. The casting, which is cored, was held in a box chuck by the end *a*, and the hole in end *b* was machined true. This was done by first using a four-lipped chucking drill, following this with a light boring cut, to straighten the hole, and finishing with the reamer. The boring tool shown at Fig. 3 makes a very good tool for work of this nature, as it is easily adjusted and inexpensive. The tool *T* is a simple forging, from round stock, with centers drilled on opposite sides, at the back end, for the points of the adjusting screws. The binder screw, shown on the top, holds the tool in position vertically, while the pointed set-screws shown at the sides adjust it laterally and hold it firmly in position. The hole in the socket, which receives the tool, is bored larger at the back, to allow for adjustment. Fig. 2 shows the method of roughing the collar and nose, leaving a very light cut for the finishing tool, Fig. 5. This tool finishes the face of the collar and the end of the nose, sizes the shoulder *S* and also the part to be threaded. An end view of Fig. 5, which is practically of the same form as Fig. 2, is shown at Fig. 6. The pilots *P*, working in the finished hole, prevent any springing of the tools, thus allowing heavy roughing cuts, without danger of throwing the work out of true, and insuring uniformity of size in finishing.

The form of threading die shown at Fig. 4 is too well known to require any description here. This also is fitted with a pilot to insure concentricity between the thread and the shoulder *S*. For the second operation a cast-iron hood or adapter *a*, Fig. 7, is fitted to the spindle of the turret lathe. This hood is bored and threaded to receive the end of the work previously finished, care being taken to have good fits at *b* and *c*, as upon these depend the truth of the work as well as the alinement of the holes. Holding the piece thus, the hole in the opposite end is finished in the same manner as in the previous operation. The tool, Fig. 8, is used to turn this end of the sleeve. It is fitted with a hardened steel bushing *D*, slightly belled at the front and ground very smooth inside. The tool shown at Fig. 9 is used to face the work to the required length and also to start the cut over the end of the work. This cut is made slightly over size, so that tool *C*, Fig. 8, will have only a light skimming cut until the end of the work is well entered in the bushing. The "ogee" is finished with the circular forming tool *F*, Fig. 7, which is mounted on the cut-off.

A sleeve of smaller dimensions is made with the same set of tools, by changing the pilots, threading die, hood and bushings for smaller ones, and readjusting the cutters. The cutting tools are of ½-inch square mushet steel, and allow of fairly high cutting speeds. The pilots are of common tool steel, hardened and ground, and are grooved for lubrication. The hole is finished with a double-end reamer. The output of the turret lathe on this piece, as compared with that of the engine lathe, is better than 5 to 1, with the quality equal.

E. E. WINSHIP.

Cleveland, Ohio.



A TURRET LATHE JOB.

A Tool for Cutting Off Soft Metal.

Editor American Machinist:

A good deal has been said lately in the "American Machinist" about cutting deep slots in tough materials like copper or iron or cutting off the same. I thought it might interest some of the readers to be

told how a friend of mine in Sweden cut off round bars of iron. It is the same principle that Brown & Sharpe make use of on their slitting saws for copper and other soft materials. He had no milling machine, and the lathes were busy at other work and too slow for the purpose, so he took the shaper and made a tool like the sketch. Point *A* is flat, and the rear point is V-shaped and 1-32 inch lower than *A*.

A TOOL FOR CUTTING OFF SOFT METAL.

It is 3-16 inch thick and made of tool steel. One of these tools is in use frequently at the shaper in our toolroom, as it cuts fast and nicely and does good and smooth work. Simple enough is it not? Still, so much cursing has been done over the old style of cutting-off tool, and none of us has thought of this simple way of doing it without having the tool stick in the slot and break. J. J. HAGELGREN.

Some New Things.

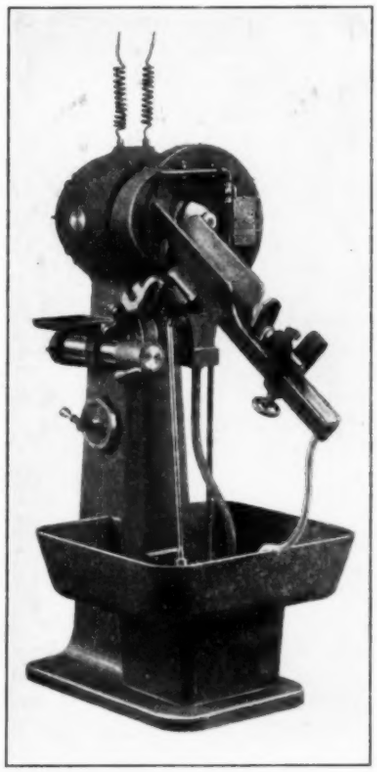
THE BESLY BAND POLISHING WHEEL.

The illustration is of a machine intended to do about the same class of work that is done by grinding and polishing wheels, but in this case it is done by a band of material charged with the emery, in the same manner that emery belts are made. This band is passed around a disk of cast iron and secured below the rim in the manner indicated. It is the work of but a minute to change from one band to another, which of course may be of the same or of any different grade of emery, and the machine is so made that either the band wheels or the regular ones may be used at pleasure. The machine is made by Charles H. Besly & Co., Chicago, Ill.

THE BESLY BAND POLISHING WHEEL.

ELECTRICALLY DRIVEN WET DRILL GRINDER.

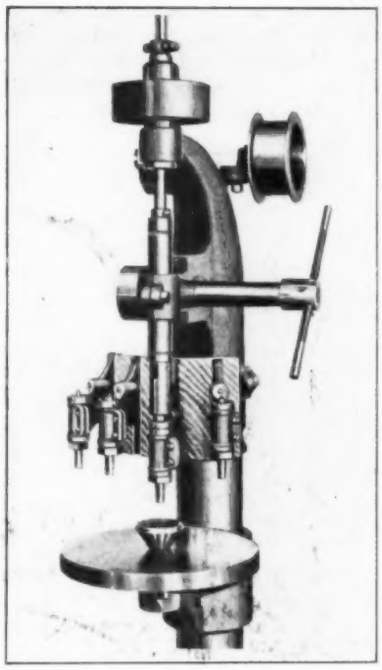
The half-tone shows the latest style of Yankee drill grinder made by Wilmarth & Morman Company, Grand Rapids, Mich. The grinding arrangements of this machine have been previously described in our columns. The present machine, which is a *wet* grinder, is driven by an electric motor direct. The motor is compound wound and is enclosed in a dust-proof case. The starting box is conveniently located in the column. Water is supplied by a centrifugal pump, and the entire grinding face is flooded. The water returns by the pipe from the lower end of the wheel hood and a rubber tube takes care of what trickles down the "V." The returning water first enters a settling space, where the heavy grindings are left. There are no bearings of any kind under water or in any way exposed to the wet and grit.



ELECTRICALLY DRIVEN WET DRILL GRINDER.

A TURRET FOR AN UPRIGHT DRILL.

The half-tone shows an application of the turret principle which is easily both understood and appreciated. The turret in this case is mounted on the round post of an upright drill, and carries, as shown here, four different heads, either of which may be brought under the main spindle and be driven by it. The heads are held up in their normal positions by pins and springs. When the main spindle is brought down it connects with the head then under it. As the spindle goes down it unlocks the head from the cylinder and at the same time locks the head to the driver in the drill spindle, and it remains locked until the drill spindle is carried back to its usual position, when it unlocks of itself and locks into the cylinder. When one of the heads is locked to the drill spindle it really becomes a part of that spindle, and little, if any, strain comes on the slides in the cylinder. The turret may be swung around out of the way, leaving a single spindle drill with no unusual features. The spindles in each head are ¾ inch in diameter and 2¼ inches long. The ends of the spindles can be fitted to a universal chuck, or bored out for straight or taper shank drills. The turret is made with any number of heads required. This attachment is made by the George Burnham Company, Worcester, Mass.



A TURRET ON AN UPRIGHT DRILL.

ELECTRIC MOTOR IN SURGICAL OPERATIONS.

One of the latest applications of electric motors is for use in surgical operations, the Lundell motor having been recently adapted to this purpose and one of them installed in the Presbyterian Hospital, at Seventieth street and Madison avenue, New York. It is stated that the operations are performed with the motor in shorter time and with less pain to the patient than under the old method of using the instruments by hand. The motor is mounted on a universal bracket with flexible shaft, with a special chuck at the end of this shaft for receiving the various instruments used for trepanning, sawing and drilling bones, etc. This gives the oper-

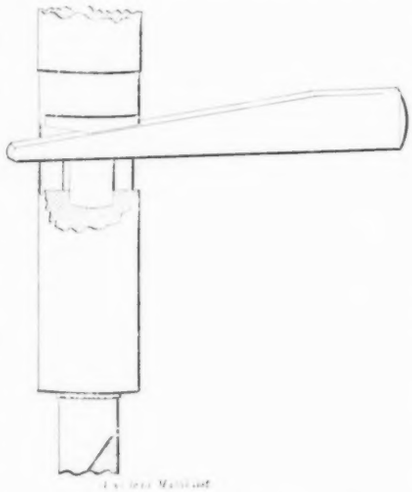
ator a free hand to guide and steady the tools, and the results are said to be very favorable indeed, and it seems likely that the Sprague Company's apparatus will be generally adopted for this purpose.

PORTABLE ACETYLENE LAMPS.

The half-tone shows two sizes of the Baldwin acetylene lamp, the smaller being known as the "Superintendent's" lamp, and the larger as the "Gang" lamp. The relative sizes are indicated by the 2-foot rule which stands between them. The small lamp has swinging side handles for carrying in the hand, and both lamps have a hook for suspending the lamp where desired. The hook turns to come over the center of the lamp and then becomes a convenient handle for carrying. The small lamp weighs but 9 ounces and burns with full brilliancy for four hours at a cost of two cents. The "Gang" lamp gives a light of 20 candle-power for eight hours at a cost of six cents for the calcium carbide. The lamps here shown are designed for mines, tunnels and other underground work, and in that service have had a sufficient trial to fully demonstrate their superiority. They should be serviceable in many other situations in railroad and engineering work. The lamps give the brightest and clearest artificial light known, are free from smoke or smell and capable of use by the unskilled. The sole agents for the lamps are the Ingersoll-Sergeant Drill Company, 26 Cortlandt street, New York.

A DRILL SOCKET AND DRIFT.

The cut herewith of a drill socket for taper shank drills, with the drift for backing out the drill, now being made by the Cleveland Twist Drill Company, is one of those things that should have been thought of and should have been done many years ago. The upper end of the slot in the socket is beveled both ways from the center, so that the drift bears squarely on the end of the drill, and neither the socket, the end of the drill nor the drift is mutilated by the operation of backing out the drill. The drift stays in place while being driven, so that two hands are enough for the man who use the combination.



IMPROVED DRILL SOCKET AND DRIFT.

Personal.

John M. Barnay, until recently chief draftsman with the New Haven Manufacturing Company, is now designing draftsman with the Bullock Electric Manufacturing Company, Cincinnati, Ohio.

Edwin S. Cramp has been elected vice-president of the William Cramp & Sons Ship and Engine Building Company, to fill the vacancy caused by the recent death of Henry W. Cramp. Mr. Cramp has long been the superintendent of the company. He has been connected with the works since his boyhood, and has devoted himself to practical construction.

Obituary.

J. K. Starley, who in 1885 made the first chain guard, rear driven or "safety" bicycle, died at Coventry, England, October 29. Mr. Starley came of a family of inventors.

Charles F. Brand, who was superintendent of the Philadelphia Structural Iron Works for many years, died October 27, eighty-one years old. He had spent all his life in Philadelphia.

William P. Hopkins died at Catasauqua, Pa., October 17, seventy years old. Mr. Hopkins was general manager of the Slatington (Pa.) Rolling Mill. He made the first sheet of tin from puddle steel, and was the inventor of the water shield for the fronts of furnaces.

John Shinn, an inventor, and for many years a patent solicitor, died in Philadelphia, October 27, seventy-nine years old. He learned the machinist trade and then brought out a number of inventions in the line of textile machinery. A few years ago he patented what he claimed to be an unbreakable shaft for steamships, and he had a patent application pending for a loom for weaving double-faced Brussels carpets.

New Corporations.

Peck Edge Tool Co., of Cohoes, N. Y.; capital, $75,000. Directors: Frederick W. Peck and Eleazer A. Peck, of Cohoes, and John H. Quimby, of New York.

Charles Creighton Foundry Co., 15 Exchange place, Jersey City, N. J.; capital, $100,000. Incorporators: J. H. Kugler, Paul W. Ryder, Edw. S. Chambless.

Standard Rotary Motor Co., 290 Eighth street, Jersey City, N. J.: capital, $1,000,000. Incorporators: Wm. C. Roberts, John N. McLean, Mark J. Strauss and Benj. Tuska.

Storey Motor & Electric Co., 321 Sussex street, Harrison, N. J.; object, manufacturing motors, etc.; capital, $500,000. Incorporators: S. Livingston Samuels, Frederick Mener and Rupert A. Jenks.

Zeedoo Manufacturing Co., of New York: object, manufacturing solutions for cleaning steam boilers; capital, $150,000. Directors: J. J. Hughes, T. J. Campbell and T. W. Pittman, of New York city.

Electric Furnace Co., of New York city; capital stock, $200,000; object, manufacturing potasn, carbide and steel. Directors: Theron Davis, Thomas Seelye and Wm. N. Barry, of New York city.

Elizabeth Brass Foundry Co.; principal office, 137 Elizabeth avenue, Elizabeth, N. J.; object, brass and iron foundry; capital, $50,000. Incorporators: Chas. C. Bussey, Chester M. Whitney and Joseph T. Hague.

Footwarmer & Heater Co.; principal office, 451 Farnsworth street, Bordentown, N. J.; object, manufacturing footwarmers; capital, $100,000. Incorporators: Wm. J. Robinson, Charles H. Whittaker, Christopher G. Boland.

P. T. Motor Co.; principal office, New Jersey Registration & Trust Co. Building, East Orange, N. J.; object, manufacturing motors; capital, $100,000. Incorporators: Albert R. Palmer, Edward T. Magoffin, John R. Turner.

Klemm Sewing Machine Co.; principal office, 38 West Hamilton place, Jersey City, N. J.; object, manufacturing sewing machines; capital, $300,000. Incorporators: P. W. Ryder, J. H. Kugler, Edw. S. Chambless.

Spiral Riveted Tube Company, Corporation Trust Co., 15 Exchange place, Jersey City, N. J.; object, manufacturing spiral pipe; capital, $175,000. Incorporators: John A. Wilbur, A. Howard Abendroth and K. K. McLaren.

White Mountain Paper Co.; principal office, Corporation Trust Co., 15 Exchange place, Jersey City, N. J.; object, manufacturing paper; capital, $15,000,000. Incorporators: John C. Morgan, Geo. H. Hensel and John M. Ferry.

Miller Pasteurizing Machine Company; principal office, Corporation Trust Co. Building, Jersey City, N. J.; object, manufacturing machinery; capital, $500,000. Incorporators: K. K. McLaren, Louis B. Dailey, Augustus S. Meeker.

Rutenber Automobile & Manufacturing Co.; principal office, 185 Montgomery street, Jersey City, N. J.; object, manufacturing automobiles; capital, $200,000. Incorporators: Geo. R. Allison, John W. Avery, H. S. C. Thornton.

Rutenbar Automobile & Manufacturing Co.; principal office, 185 Montgomery street, Jersey City, N. J.; object, manufacturing automobiles; capital, $200,000. Incorporators: George R. Allison, John W. Avery, H. G. C. Thornton.

Hogan Motor Co., of West Haven, Conn.; principal office, 185 Montgomery street, Jersey City, N. J.; object, manufacturing motors, etc.; capital, $75,000. Incorporators: Frederick Brown Wells, Edwin S. Thomas, John J. Hogan.

Sterling Electric Motor Co.; principal office, N. J. Registration & Trust Co. Building, East Orange, N. J.; object, manufacturing electric motors; capital, $30,000. Incorporators: James R. Mapletoft, Frank C. Ferguson, H. M. Smith.

The National Acme Machine Company, of Cleveland, O., has been incorporated, with a capital stock of $750,000. The incorporators are F. H. Goff, E. A. Foote, W. F. Carr, C. H. Gale and E. M. De Garmo. It is stated that a factory will be erected.

Hoyeg Patent Mortar Mixer Co.; principal office, 185 Montgomery street, Jersey City, N. J.; object, dealing in patent mortar mixer under United States letters patent; capital, $500,000. Incorporators: John W. Avery, George R. Allison, Ralph McKee.

Toledo Scale & Cash Register Co.; principal office, 20 Bruen street, Newark, N. J.; authorized capital, $1,000,000. Among the incorporators are: L. S. Rose and E. J. Whitney, of Newark. The company's plant will, it is said, be erected in that city.

International Garrigus Boiler Cleaner Co.; principal office, New Jersey Corporation Guarantee & Trust Co. Building, Camden, N. J.; object, manufacturing boiler cleaners; capital, $1,500,000. Incorporators: F. R. Hansell, Wm. F. Eidell, John A. MacPeak.

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 40.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Wanted—A Ballou lathe. Box 167, Am. M.

Wanted—Improvements in grinding machinery. Address Box 1435, Providence, R. I.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

For Sale—One 2 H. P. Shipman kerosene engine; can be seen running; price, $50. Box 1171, Springfield, Mass.

"Brandt's Triple Expansion Gaskets" are the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

See 12 presses & dies for sheet-metals, S. E. cor. Machinery Hall, Buffalo Exposition. Ferracute Mch. Co., Bridgeton, N. J.

Special tools, models, fine light mach'y and foundry work wanted. Murray Mfg. Co., Richmond Valley, Staten Island, N. Y.

For Sale—One Hanson & Van Winkle No. 1 225-watt dynamo, nearly new; rheostat, two nickel-plating tanks, with all connecting rods. E. D. Luedders, Coldwater, Mich.

A young man in Philadelphia, with a thoroughly equipped machine shop, desires to manufacture some specialty. H. Bartol Brazier, 1811 Fitzwater st., Philadelphia, Pa.

High-class machine design and drafting of all kinds done at reasonable rates by a responsible engineering firm; ideas developed; all business confidential. C. & N., care A. M.

To Be Sold—The wholesale manufacturing rights in North America of a very well introduced article of consumption. For particulars address E. 3847 Lz., care of Haasenstein & Vogler, Lucerne, Switzerland.

Purchaser for small manufacturing plant; lot, 100x180 feet; machine shop, 32x68, two story, with line shaft and gasoline power; foundry, 40x54, new modern equipment; good location; for sale cheap. Hart-Parr Co., Madison, Wis.

A prominent typewriter manufacturing company have just opened a department for the manufacture and sale of novelties. Responsible parties having something of this class to turn out will oblige by addressing "Work," care American Machinist.

Party with medium size, modern, up-to-date machine shop equipment, that can and will remove to another locality, can learn of an unusually good opportunity to form valuable associations by addressing, with details, "Permanent Business," care Amer. Machinist.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents.

Situations Wanted.

Experienced cost clerk; capable in cotton mill or machine work. Box 160, Am. Mach.

Draftsman, graduate, with several years' experience, wants position. Box 182, Am. M.

Graduated mechanical draftsman, with 11 years' experience, wants position. Box 179, American Machinist.

Ship draftsman, graduate, with 5 years' European experience, wants situation. Address A. S., 439 Henry st., Brooklyn.

Premium system expert and cost-keeper would like change of position. Address "Machinist," care American Machinist.

Responsible "drop" die sinker is open for engagement; best references. Please address "Die Sinker," care American Machinist.

Mechanical engineer and machine designer desires change; technical man with 8 years' practical experience. Box 136, Am. Mach.

Practical draftsman and superintendent, experienced in automobile and gas engine building. "Designer," care American Machinist.

Wanted—To correspond with concern wanting a practical gas-engine man. State your requirements, and address Box 183, Am. Mach.

Foreman patternmaker desires a change; 20 years' experience; best of references; reasonable salary. Address, with offer, Box 184, American Machinist.

Machine shop foreman, familiar with modern machine practice, hustler and cost reducer, 35 years of age, open for engagement. Box 185, American Machinist.

Foreman patternmaker wishes to correspond with reliable firm, having had large experience in plate patterns and molding machines. Box 178, American Machinist.

An expert designer and builder of printing machinery is open to accept a responsible position, where ability and ingenuity are required. Box 161, American Machinist.

Graduate mechanical draftsman, experienced in construction of pulp and paper mills and pulp and paper machinery, desires permanent position; best references; age 27; married. Address A. J., care American Machinist.

Position as superintendent or general foreman; am conversant with the machine business in all its branches, a designer of tools, jigs and modern appliances for economical production. Box 163, American Machinist.

A practical superintendent or general foreman, of 23 years' experience in machine shops, tools, dies and drafting, 6 years in present position as superintendent, wishes to locate in Omaha, Neb., or vicinity. Address 594 W. North ave., Chicago, Ill.

Position as superintendent or general foreman, by practical mechanic, up to date in modern methods, organizing and the handling of men to obtain best results, duplication of parts, shop management; best references furnished. Address Box 171, Amer. Machinist.

Superintendent, at present in charge of large concern, will be open for engagement December 1; familiar with cost-reducing methods of large modern manufacturing plants, also contracting shops; good estimater and designer; both practical and technical engineer. Address Box 168, Amer. Machinist.

Position wanted by a mechanical engineer, 20 years' wide experience, good executive ability, now in a responsible position with large firm who manufacture machinery and tools, and produce work from same upon the interchangeable system; have first-class cost-account system; is open for a position as mechanical engineer, superintendent or manager; the best of reasons for desiring a change; might invest in a growing concern. Box 159, American Machinist.

Help Wanted.

Machinists to sell my calipers, etc.; big inducements. E. G. Smith, Columbia, Pa.

Wanted—Machine shop foreman for engine works. Box 186, American Machinist.

Wanted—First-class wood and metal pattern makers. The Goulds Mfg. Co., Seneca Falls, N. Y.

Wanted—Accurate machinist for marine engine work. Apply Ward Engineering Works, Charleston, W. Va.

Wanted—First-class machinists on engine work; no labor trouble. Address Reeves Machine Co., Trenton, N. J.

Wanted—Draftsman on general mechanical work; state salary expected and experience. Box 176, American Machinist.

Wanted—Metal patternmakers; state experience and wages expected; good position for right man. Box 154, Amer. Machinist.

Wanted—First-class mechanical draftsman; state experience, reference, age and salary expected. Address Box 180, Amer. Machinist.

F. W. Meyer Marine Indicating System Co.; principal office, 76 Montgomery street, Jersey City, N. J.; object, manufacturing machinery; capital, $10,000. Incorporators: Frederick W. Meyer, Hermann Behrens, Jr., Louis G. Morten, Frederick Flad, John Dennison.

The Textile Machinery Improvement Co.; principal office, Corporation Trust Co. Building, 15 Exchange Place, Jersey City, N. J.; object, manufacturing machinery; capital, $10,000. Incorporators: H. H. Manhinney, Obin B. Roberts and K. K. McLaren.

Rotary Braiding Machine Co.; principal office, New Jersey Corporation Guarantee & Trust Co. Building, Camden, N. J.; object, manufacture braiding machines; capital, $300,000. Incorporators: Arthur C. Dennisston, James A. MacPeak, Wm. F. Eidell.

Pittsburgh Pattern Co.; principal office, Corporation Trust Co. Building, 15 Exchange place, Jersey City, N. J.; object, manufacturing patterns for iron, steel and brass work; capital, $5,000. Incorporators: Wm. D. Brown, George L. Eaton, Gustav C. Lubitz.

Holyoke Steam Boiler Works (incorporated company); principal office, New Jersey Registration & Trust Co. Building, East Orange, N. J.; object, manufacturing steam boilers and appliances. Incorporators: William A. Coghlan, Francis A. Kennedy, Thomas H. Sears.

Ames Shovel & Tool Co.; principal office, Corporation Trust Co. Building, 15 Exchange place, Jersey City, N. J.; object, manufacture all kinds of agricultural, farming and garden tools; capital, $5,000,000. Incorporators: Lawrence Greer, H. B. Taylor, Oliver W. Mink.

American Ice Co., of Philadelphia, Pa.; principal office, 207 Market street, Camden, N. J.; object, manufacturing ice and ice-making machines; capital, $100,000. Incorporators: Frank Schanz, Harry G. Franklin, John L. Franklin, J. Frank Glendenning, Rudolph Preisendanz.

Bar-West Coaster Brake Co.; principl office, Montgomery and Washington streets, Jersey City, N. J.; object, manufacturing automatic coaster brakes, etc.; capital, $100,000. Incorporators: Franklin F. Weston, Perley M. Berry, Francis G. Coates, F. P. McManus and J. M. Enright.

Graham-Fox Motor Co., of New York city; object, manufacturing motors and automobiles; capital, $500,000. Directors: Frank A. Fox and David F. Graham, of Stamford, Conn.; James J. Thornley, Jr., of Brooklyn; C. G. Weaver, of New York city, and W. D. Blake, of Richmond Hill, L. I.

Application has been made to-day by John Stevenson, Jr., N. McConnell, D. Adams and J. P. Whitla, Sharon, Pa.; George W. Darr, New York, and William Flinn, of Pittsburgh, for the charter of a corporation to be called the Sharon Sheet Steel Company. It is a constituent concern of the Sharon Steel Company and will erect sheet mills and a galvanizing plant to cost $600,000.

New Catalogs.

The E. W. Vanduzen Company, 428 East Second street, Cincinnati, O., has sent us a catalog and price list of steam jet pumps, syphons, special pumps and barge pumps. Size, 4½x5 inches.

The West Virginia Pulley Company, Clarksburg, W. Va., has published a little pamphlet containing the standard price list of its laminated rim wood split pulleys. This is 3½x6 inches, standard size.

George M. Naylor, power-transmitting machinery and mill supplies, 300 West Broadway, New York, has sent us a catalog of shafting appurtenances, such as hangers, capillary boxes, pillow blocks and couplings. It is 3½x6 inches, standard size.

Help Wanted—Continued.

Foreman brass molder, first class, conversant with engineers' and plumbers' supplies; state experience and salary expected. Box 177, AMERICAN MACHINIST.

We are starting a new plant and invite application from first-class wood pattern makers and machinists. Address De Laval Steam Turbine Co., Trenton, N. J.

Mechanical draftsman wanted; preferably one familiar with coal-handling machinery; state age, salary expected and reference. Box 174, AMERICAN MACHINIST.

Good patternmakers, both wood and metal, desiring steady employment, will find it to their advantage to apply to the General Electric Co., Schenectady, N. Y.

Machinists wanted; 6 first-class machine hands for heavy work; first-class wages will be paid to reliable men. Apply to Vulcan Foundry & Machine Co., New Castle, Pa.

Wanted—Three expert planer hands; good wages; steady work guaranteed; no labor trouble; nine-hour day. Apply Pittsburgh Shear Knife & Machine Co., Pittsburgh, Pa.

Wanted—A draftsman experienced in detail drawing and tool designing, capable of taking charge of office employing about 30 men. Address, with particulars, Box 156, AM. MACH.

Wanted—Blacksmith, familiar with machinery, forgings and use of steam hammer; steady work and good wages to an expert, reliable man. Address "South Carolina," AM. M.

Wanted—Two machinists; one to operate Niles floor boring machine, and one for 6 ft. Niles boring mill; experienced men only; wages $3.50 and $3.25 per day. Address Abner Doble Co., San Francisco, Cal.

Wanted—Machinists, first-class toolmakers, vise hands, planer and boring mill hands on heavy work, wood and metal patternmakers. Apply C. C. Tyler, Superintendent, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Mechanical superintendent wanted, familiar with the manufacture of firearms on a large scale, possessing executive and mechanical ability. Address, stating age, experience and references, A., Box 2123, General Post Office, New York.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—A draftsman experienced in designing pump and compressor work, who is also well up in best methods of gas engine design and construction. Address, giving references, age and salary expected, "Venango," care AMERICAN MACHINIST.

Shop superintendent, capable of handling the manufacturing end of a concern employing upwards of 400 men on gas and steam engines, stand pipes and heavy plate work; modern and well-equipped shop. Address Box 153, AMERICAN MACHINIST.

Wanted—A foreman for about 30 men on small interchangeable work; must be a thoroughly practical man and able to handle men to best advantage; steady position to a man who can get out good work in large quantities. Box 175, AMERICAN MACHINIST.

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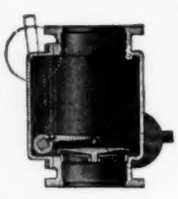

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